T A B L E O F C O N T E N T S

Trouble-shooting instructions : MB-5016

BOSCH system : KE 3.1-Jetronic

Make of vehicle : MERCEDES-BENZ

Basic microcard : PKW-014

Test instructions	Coordinates
Special features	A02
Self-diagnosis / Rapid diagnosis chart	A07-A18
Test specifications	A03-A06
Electrical terminal diagram	A19-A22
Electrical wiring diagram	
Hydraulic-lines diagram	
Diagram of air / fuel lines	
Tools and test equipment	
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Tests without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* These instructions contain the KE 3.1-Jetronic trouble-shooting instructions, valid at the time of publication, for the following Mercedes-Benz model: 560 SEL/SEC, 5,61/8Zyl. 10.85->

* Trouble-shooting with these instructions may only then take place when the details of the "Summary - Service Information for Vehicles" (KFZ-000) coincide with those of the vehicle type and with the BOSCH number of the KE-Jetronic control unit installed.

* Control unit using digital techniques, characteristic-map control using microprocessor.

* Multi-functional fuel-management system with a characteristic map for operation with lambda closed-loop control (CAT) and a characteristic map for operation without lambda closed-loop control (ECE). Activation of the characteristic maps by trimming plug with corresponding marking. To set to the fuel grades unleaded regular and unleaded premium, only the ignition trimming plug must be re-connected.

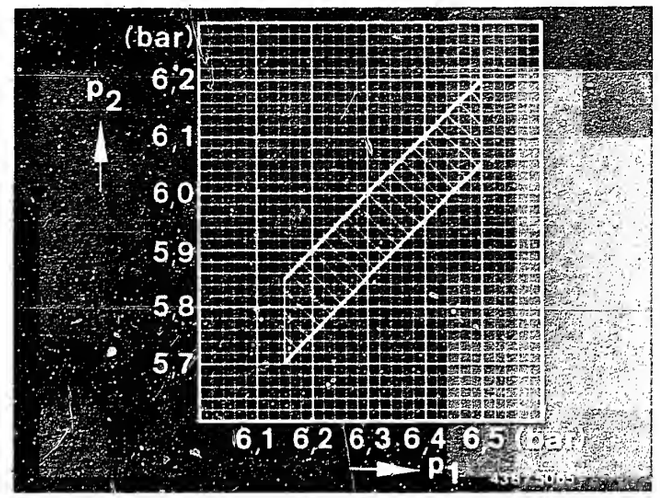
* Electronically controlled idle-speed control with single-winding rotary actuator, without bypass adjusting screw.

* Activated-carbon filter and regeneration valve for return of gasoline vapors into the intake manifold. (Fuel evaporation system)

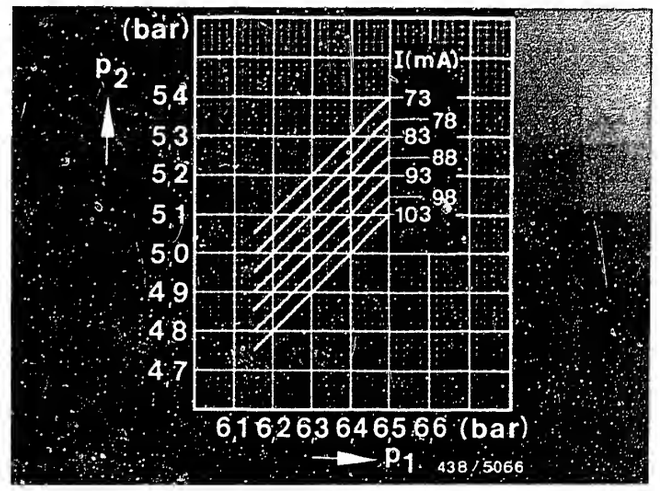
* Secondary air injection (only in CAT version)

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification	
1	Electric fuel pump – fuel delivery:	At least > 1950 cm ^{3} /min	
2	Primary pressure:	6,15...6,5 bar	
3	Differential pressure: Suppression of peak coil current: Actuate starting motor with fuel-pump relay disconnected. Do not switch off ignition after starting. Take lower-chamber pressure set value "warm" from top chart corresponding to primary pressure measured. (Actuator current 0 mA) Take lower-chamber pressure set value "cold" from bottom chart corresponding to primary pressure measured and actuator current. Tolerance ± 0.15 bar. Simulation of "cold" state: press push-button 3 at test adapter.		
4	Leakage test, complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 3,3 bar 3,2 bar	
5	Injection valves, opening pressure:	3,7...4,8 bar	
6	Fuel deliveries, comparative measurement: (Actuator current 0 mA) Idle: Part load: Full load: Min. delivery at max. air-flow sensor plate defl.:	Setting point: (cm ^{3} /min) 6,0 40,0 100,0 140 cm ^{3} /min	Max. permis. delivery: (cm ^{3} /min) 6,8 42,5 109,0



p_1 = Primary pressure
p_2 = Lower-chamber pressure



A03 —— ⟹

A04 —— ⟺

TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
7	Rate of flow, KE restriction:	130...150 cm^3 /min
8	Temperature sensor, air (NTC I): Air temperature +15...+30°C:	 1,3...3,6 k Ω
9	Temperature sensor, engine (NTC II): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	 1,3...3,6 k Ω 250...390 Ω
10	Idle-mixture-adjusting screw basic setting: Fuel-distributor seat - needle bearing:	 22,6...22,8 mm
11	Idle adjustment: Low-idle-speed control (non-Bosch product). For testing, engine at norm. op. temperature. Idle speed: Idle-actuator current at idle speed: Engage driving position, speed: <u>Only ECE</u>: CO concentration in exhaust gas: <u>Only CAT</u>: Check lambda closed-loop control: Measurement with lambda closed-loop control tester (e.g. KDJE-P 600) and adapter lead (e.g. KDJE-P 600/52) at diagnosis socket outlet (pin 3). Alternatively: Current measurement using universal test adapter. Put fuel evaporation system out of operation. Determine on/off ratio (mean value) at n = 2500 min^{-1} . Deviation of on/off ratio (mean value) at idle compared to n = 2500 min^{-1} : Adjustment at idle-mixture-adjusting screw. After adjustment, repeat measurement.	 600...700 min^{-1} 700...1000 mA 500...600 min^{-1} 1...2 % CO by vol. +5...+15 %

SELF-DIAGNOSIS

All Daimler-Benz 8-cylinder engines have been equipped as of FD 552 with self-diagnosis using on-off ratio measurement.

Defective input signals of the KE-Jetronic control unit may be indicated at the lambda test output (diagnosis socket outlet, socket 3) using the lambda closed-loop control tester.

Short circuiting and breaks in lines are detected. Sporadically occurring faults (e.g. loose contact) are not detected. Output of the fault signals takes priority over output of the lambda closed-loop control signal.

The faults which can be indicated are not discussed in detail here, since the input signals of the KE-Jetronic control unit may be tested using the universal test adapter (rapid diagnosis chart).

However, should a constant on-off ratio be indicated when testing the lambda closed-loop control using on-off ratio measurement, the input signals of the KE-Jetronic control unit must be checked (rapid diagnosis chart).

RAPID DIAGNOSIS CHART TO UNIVERSAL TEST ADAPTER ETT 018.01 WITH KE3 ADAPTER LEAD 1 684 463 169 AND APPROPRIATE MULTITESTER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electric/electronic peripheral and control-unit functions of the KE-Jetronic, including the lambda closed-loop control.

Important note on the rapid diagnosis chart:

The "Test conditions" column gives information as to in which test steps the control-unit plug must be connected/disconnected. Make absolutely certain that there is no current at the system when connecting or disconnecting, i.e. the ignition must be switched off and the electric safety circuit must not be short circuited.

The "Test connections" column provides information about the leads connected to the respective measuring path, referring to the assignment in the control-unit plug. Possibly necessary trouble-shooting is with regard to these leads.

The "Test specifications" column contains the test specifications for both the version without lambda closed-loop control (ECE, left-hand test-specifications column) and for the version with lambda closed-loop control (CAT, right-hand test-specifications column). Before starting testing, determine which version is being tested. If only one test specification is given, this applies to both versions.

Attention: When carrying out the test, make sure that the trimming plug is in position 1.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
1	V	4	–	Int. resistance(R_i) pressure actuator	12–10	Disconnect control-unit lead plug.	20...30 Ω
2	V	5	–	Resistor NTC II (engine)	21– 2	Engine temperature +15°...+30° C: approx. +80° C :	1,3...3,6 k Ω 250...390 Ω
3	V	6	–	Resistor NTC I (intake air)	11– 2	Air temperature in area of NTC I: +15°...+30° C:	1,3...3,6 k Ω
4				Signal, altitude sensor		Connect control unit. Switch on ignition. Voltmeter connection to blue Ω sockets. Signal altitude-dependent: 0 meters (sea level): 500 meters: 1000 meters: 1500 meters: 2000 meters: 3000 meters:	Test step not applicable!
5	V	9	–	Throttle-valve switch, idle	13– 2	Switch off ignition. Disconnect control-unit lead plug. Throttle valve closed: open:	 0...10 Ω > 1000 Ω
6	V	10	–	Throttle-valve switch, full load	5– 2	Throttle valve closed: fully open:	infinite Ω > 5000 Ω
7	V	11	–	Microswitch idle linkage	24– 2	Throttle valve closed: open:	0...10 Ω infinite Ω
8	V	12	–	Ground, control unit	20– 2		——— Ω
9	V	13	–	Ground, pin 7	7– 2	Switch off ignition. Connect control unit.	0...10 Ω

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications ECE	CAT
10	| V	14	–	Trimming plug mixture map	22– 2	Disconnect control-unit lead plug. Disconnect lead plug from air-flow sensor potentiometer and connect socket 1 of plug (in upper installation position) to engine ground.		
						Trimming-plug position 1:	50... 60 Ω	900... 1020 Ω
						2:	100... 120 Ω	1200... 1350 Ω
						3:	150... 190 Ω	1500... 1750 Ω
						4:	230... 270 Ω	2000... 2400 Ω
						5:	330... 370 Ω	3000... 3600 Ω
						6:	430... 470 Ω	5000... 5600 Ω
						7:	570... 620 Ω	11000...12000 Ω
11	| V	15	–	Transmission switch (only automatic transmission)	16– 2	Connect air-flow sensor potentiometer.		
						Selection lever posn. P, N:	0...10 Ω	
						Driving position selected:	infinite Ω	
12	5	–	–	TD signal	25– 2	Start eng. (starting motor):	Voltage undefined	
13	6	–	–	Control-unit supply	1– 2	Switch on ignition:	8...15 V	
14	7	–	–	Idle actuator supply and continuity	3– 2	Switch on ignition:	——— V	
15	8	–	–	Tempomat signal	6– 2	Switch Tempomat operation:	——— V	
16	9	–	–	Air-conditioner cut-in signal	19– 2	Switch off ignition. Connect control unit. Start engine, switch on air conditioner.		
						Temperature regulator = minimum temperature:	——— V	
17	10	–	–	Supply, air-flow sensor potentiometer	18– 2	Switch on ignition:	4,35...5,35 V	

A11 — <⟹>

A12 — <⟹>

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specificatons ECE	CAT
18	11	–	–	Signal, air–flow sensor potentiometer	17– 2	Switch on ignition. Air–flow sensor plate in neutral position: Deflect air–flow sensor plate by hand, continuous voltage rise up to max.:	0 V 5,35 V	
19	13	–	1	Temperature signal from control unit	9– 2	Switch on ignition. While actuating btn 1:	1,5...1,9 V	
20	14	–	–	Consumption signal	4– 2	Start engine – idle: With regulation:	Voltage indefined Voltage change	
21	–	–	–	Peak coil current	12–12	Switch on ignition:	–>FD —— : ——— mA FD 546–>: 60...80 mA	–>FD —— : ——— mA FD 546–>: 65...85 mA
22	–	–	1	Warm–up enrichment +20°C	12–12	Warm up engine – idle. Current value with btn 1 pressed:	–>FD —— : ——— mA FD 546–>: 7...11 mA	–>FD 551 : 8...12 mA FD 552–>: 3... 5 mA
23	–	24	2	Actuator current Engine at norm. op. temp.	12–12	Eng. at norm. op. temp., idle Current valve with btn 2 pressed: With CAT, oscillating, mean value:	–>FD —— : ——— mA FD 546–>: 2... 4 mA	–>FD —— : ——— mA FD 546–>: –1...+1 mA
24	–	21	1	Starting enrichment	12–12	So that eng. fails to start: Disconnect speed relay for elec. fuel pump. Short circuit ign. coil term.4 to grnd via resist. of at least 2k Ω (E.g. with sleeve–type suppressor and spark gap) While btn 1 pressed, actuate starting motor. Current rise (max. 1 s.) to:	–>FD —— : ——— mA FD 546–>: 100...130 mA	–>FD —— : ——— mA FD 546–>: 120...150 mA

FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

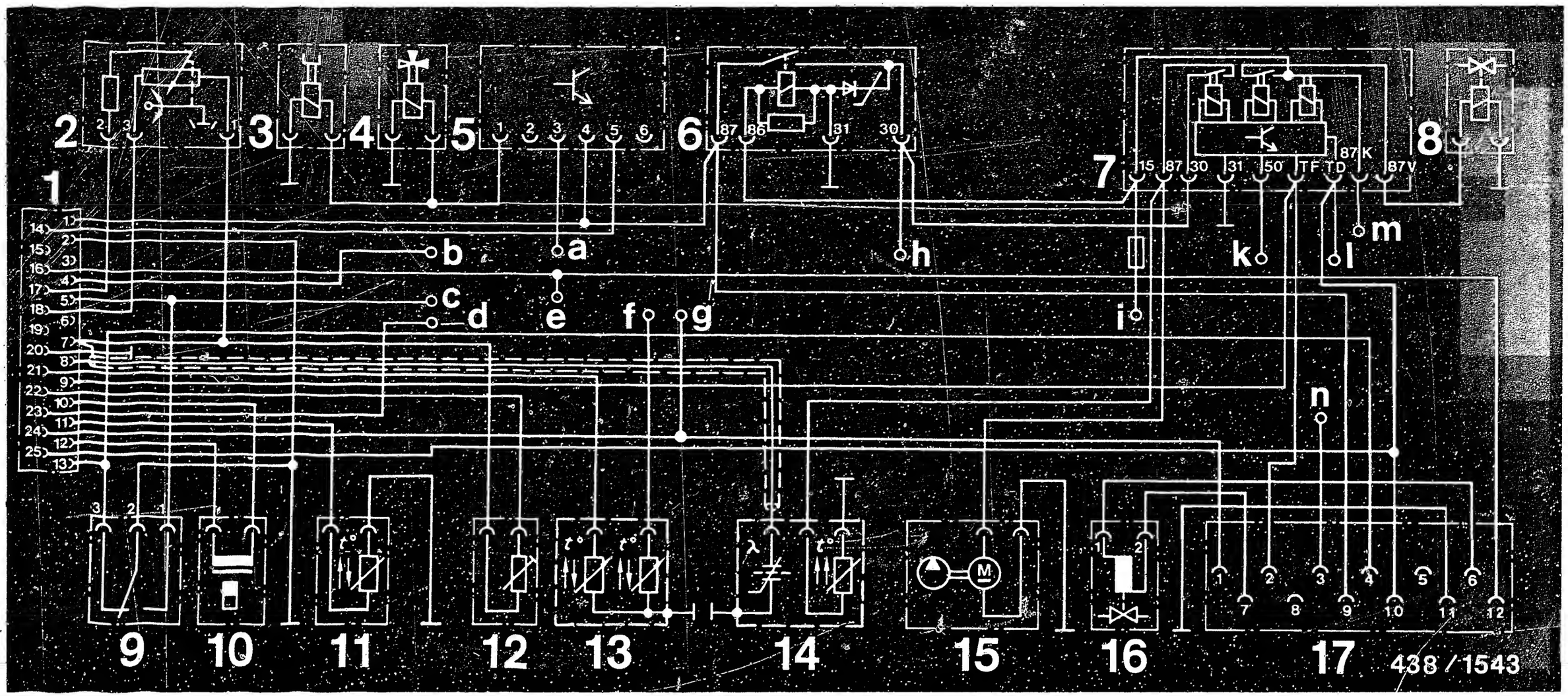
No.	Switch/Btn V	Switch/Btn Ω	Switch/Btn Btn	Under test	Test pins	Test conditions	Test specifications ECE		Test specifications CAT	
25	–	21	1	Post-start enrichment	12–12	Start engine (at normal op. temp.) while actuating btn 1. Current value: Current value const. for app. Then slow speed reg. to:	–>FD —— FD 546–>: –>FD —— FD 546–>: –>FD —— FD 546–>:	——— mA 15...25 mA ——— s 4...10 s ——— mA 7...11 mA	–>FD 551 FD 552–>: –>FD 551 FD 552–>: –>FD 551 FD 552–>:	40...50 mA 30...40 mA 3... 9 s 9...17 s 8...12 mA 3... 5 mA
26	–	21	1	Acceleration enrichment	12–12	Eng. at norm. op. temp., idle While actuating btn 1, perform snap acceleration of eng Thus current rise (approx. 1 s) to: <u>Note:</u> Level of current value dependent upon intensity of acceleration (travel/ duration of air-flow sensor plate movement).	–>FD —— FD 546–>:	——— mA 60...80 mA	–>FD —— FD 546–>:	——— mA 50...70 mA
27	–	–	–	Overrun cut-off	12–12	Re-connect ohmmeter (swap positive and negative). Start eng. (norm. op. temp.). Speed n to approx.: Hold there. Manually actuate idle throttle-valve switch (for 4- and 6- cyl. eng. microswitch at accelerator linkage). Engine hunts. Current reading during falling speed phase:	–>FD —— FD 546–>: ———	——— min^{-1} 1800 min^{-1} –40...–80 mA	–>FD —— FD 546–>: ———	——— min^{-1} 1700 min^{-1} –40...–80 mA

FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications ECE	CAT
28	–	24	–	Full-load enrichment	12-12	Eng. at norm. op. temp., idle Current value (ECE): With CAT, oscil., mean value: Briefly push accelerator pedal to floor (full-load throttle-valve switch must switch). During speed rise, current value rises by: Attention: Do this very briefly, so that speed does not rise too much and engine is not damaged.	->FD —— : ——— mA FD 546->: 2... 4 mA ->FD —— : ——— mA FD 546->: 3... 6 mA	->FD —— : ——— mA FD 546->: -1...+1 mA ->FD —— : ——— mA FD 546->: 3... 6 mA
29	–	21	–	Lambda closed-loop control, open-loop control mode	12-12	Disconnect regeneration lead to throttle-valve assembly at regeneration valve and seal. Eng. at norm. op. temp., idle Current value:	——	-1... +1 mA
30	–	24	–	Lambda closed-loop control, closed-loop control mode	12-12	Eng. at norm. op. temp., idle Closed-loop control mode can be recognized from the oscillating current reading. Mean value: If mean value outside tolerance, set (idle-mixture-adjusting screw) to:	—— ——	-1... +1 mA approx. 0 mA
31	–	22	–	Lambda closed-loop control, rich stop	12-12	Eng. at norm. op. temp., idle Current rise to:	——	10... 14 mA
32	–	23	–	Lambda closed-loop control, lean stop	12-12	Eng. at norm. op. temp., idle Current drop to:	——	-10...-14 mA

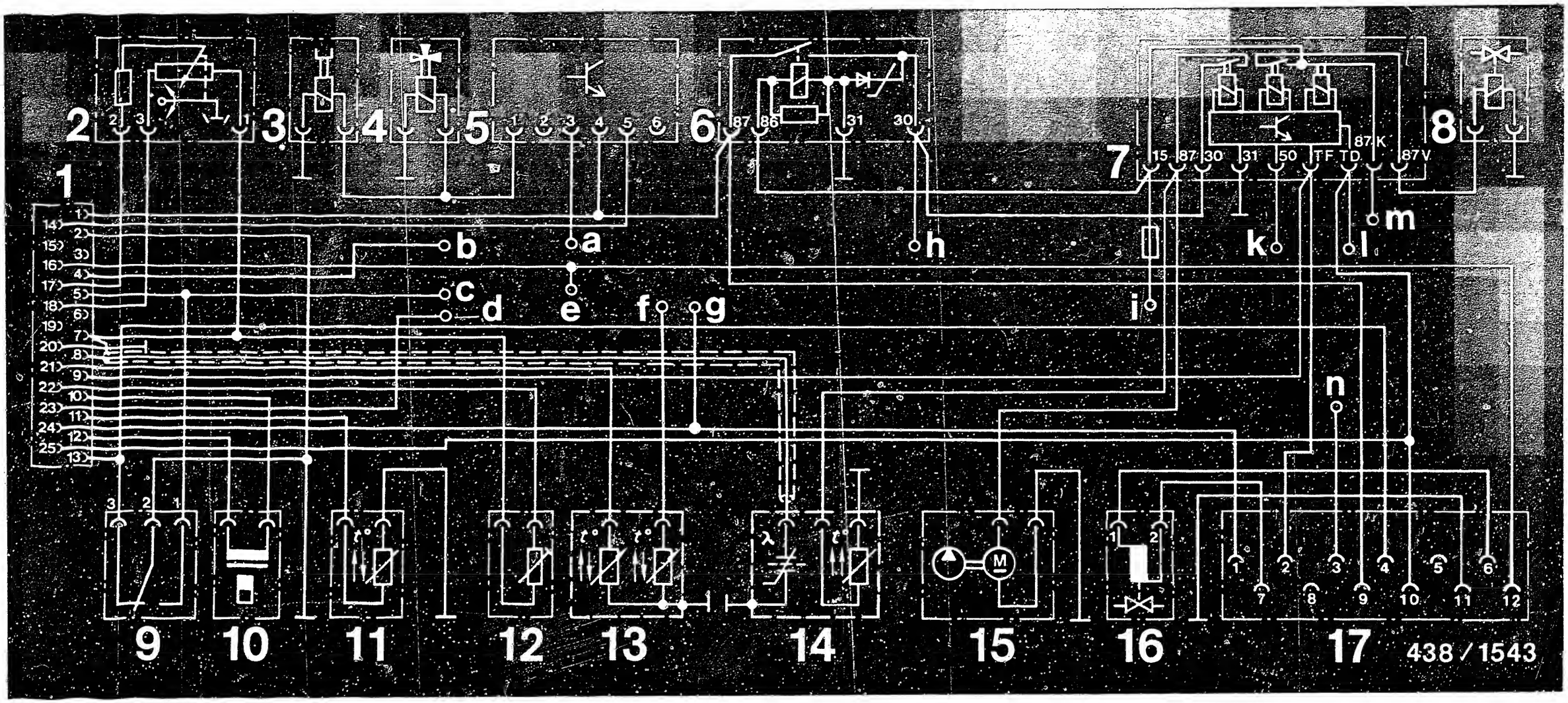
FD = Date of manufacture



1 = Control unit, KE-Jetronic
2 = Air-flow sensor potentiometer
3 = Electro-magnetic coupling, air pump (only CAT)
4 = Change-over valve, air pump (only CAT)
5 = Relay, air injection (only CAT)
6 = Over-voltage protection relay
7 = Electronic relay
8 = Cold-start valve
9 = Throttle-valve switch, idle/full load
10 = Electro-hydraulic pressure actuator
11 = Temperature sensor (intake air)
12 = Trimming plug, mixture map
13 = Temperature sensor, coolant (Double NTC)
14 = Heated lambda sensor
15 = Electric fuel pump
(2 pumps are installed, connected in parallel)
16 = Idle actuator (non-Bosch product)
17 = Control unit, low-idle-speed control
(non-Bosch product)

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT

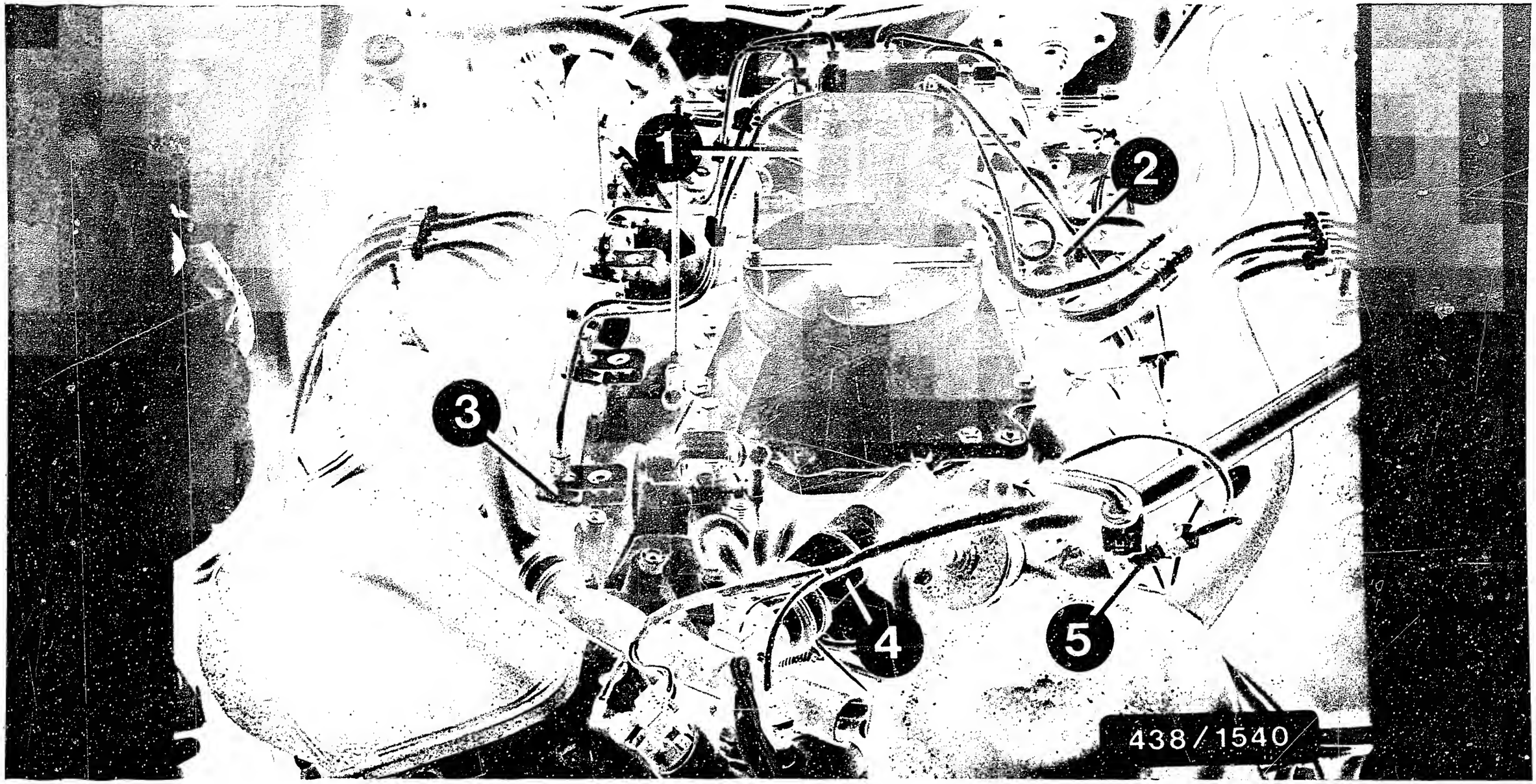
A19 ⟹
A20 ⟺



a = Terminal 15
b = Plug connection, trip computer
c = Trigger box, ignition system
d = Lambda test output (diagnosis socket outlet, socket 3)
e = Plug connection, start-locking switch, socket 3
f = Trigger box, ignition system
g = Speed signal

h = Terminal 30
i = Terminal 15 (fuse 7)
k = Plug connection, start-locking switch, socket 4
l = Terminal TD, ignition
m = Kick-down switch, socket 1
n = Control unit, compressor cutoff

Electrical terminal diagram with electric fuel pump safety circuit (continued)



1 = Mixture-control unit
2 = Pressure regulator
3 = Injection valve
4 = Idle actuator (non-Bosch product)
5 = Cold-start valve

INSTALLATION POSITION OF COMPONENTS

A23 —⟹

A24 —⟺

Installation position of further components

KE-Jetronic control unit, trimming plug mixture map:
In footwell at right behind side panel

Relay, electric fuel pump:
In engine compartment at left.

Relay, over-voltage protection:
In engine compartment at left.

Temperature sensor, engine (NTC II):
At left (referring to forward direction of travel) at rear at cylinder head.

For production reasons:
continued on the following coordinate.

T A B L E O F C O N T E N T S

Trouble-shooting instructions : MB-5012

BOSCH system : KE 3.1 - Jetronic

Make of vehicle : Mercedes-Benz

Basic microcard : PKW-014

Test instructions	Coordinates
Special features	B02
Self-diagnosis / Rapid diagnosis chart	B07-B18
Test specifications	B03-B06
Electrical terminal diagram	B19-B22
Electrical wiring diagram	
Hydraulic-lines diagram	
Diagram of air / fuel lines	
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Installation position of components	B23-B25
Notes on removal and installation	
General important information	

Tests without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* This microcard contains the trouble-shooting instructions for the following model valid at the time of writing:

MERCEDES-BENZ
560 SEL/SEC, 5,61/8-Zyl.-Mot. (EU) 10.85->

* Trouble-shooting can be carried out using these instructions only when the specifications of the "Overview of after-sales service information for vehicles" (KFZ-0..) agree with the vehicle type and the BOSCH number of the KE-Jetronic control unit installed.

* Control unit uses digital logic, characteristic-map control through microprocessor.

* Electronic low-idle-speed control with single-winding rotary idle actuator, without bypass adjustment screw.

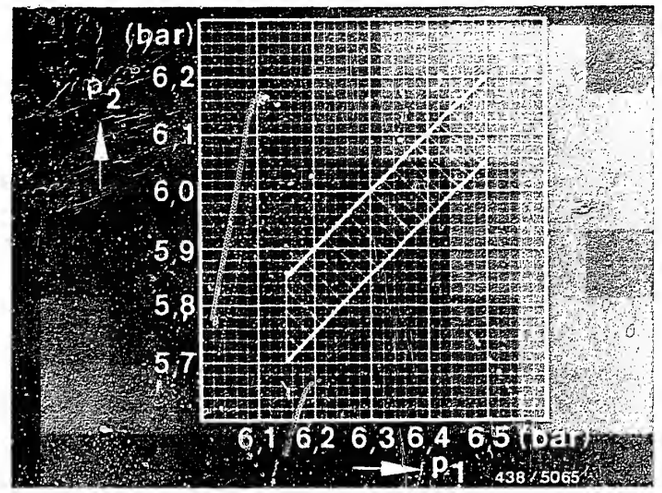
* Activated-charcoal filter and regeneration valve for returning gasoline fumes into the the intake manifold (fuel vaporization system).

Important note:

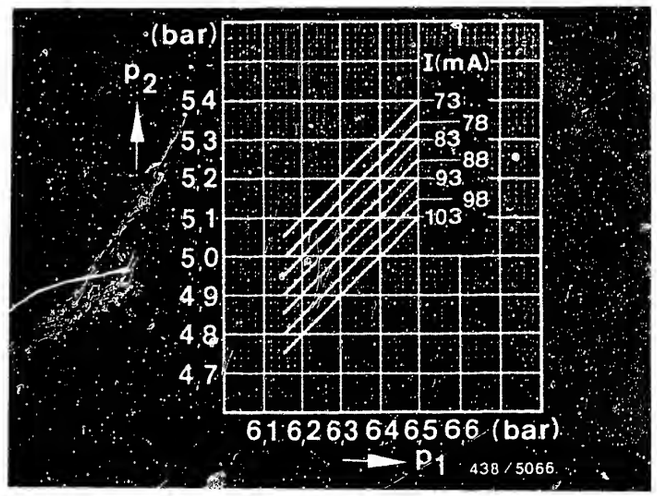
When referring to a basic microcard, note that the test specifications should always be taken from the vehicle-specific brief instructions.

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification	
1	Electric fuel pump – fuel delivery:	At least 2200 cm ^{3} /min	
2	Primary pressure:	6,15...6,5 bar	
3	Differential pressure: Suppression of peak coil current: Actuate starting motor with fuel-pump relay disconnected. Do not switch off ignition after starting. Take lower-chamber pressure set value "warm" from top chart corresponding to primary pressure measured. (Actuator current 0 mA) Take lower-chamber pressure set value "cold" from bottom chart corresponding to primary pressure measured and actuator current. Tolerance ± 0,15 bar. Simulation of "cold" state: press push-button 3 at test adapter.		
4	Leakage test, complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 3,3 bar 3,2 bar	
5	Injection valves, opening pressure:	3,7...4,8 bar	
6	Fuel deliveries, comparative measurement: (Actuator current 0 mA)	Setting point: (cm ^{3} /min)	Max. permis. delivery: (cm ^{3} /min)
	Idle: Part load: Full load:	6,0 40,0 100,0	6,8 42,5 109,0
	Min. delivery at max. air-flow sensor plate defl.:	140,0 cm ^{3} /min	



p_1 = Primary pressure
p_2 = Lower-chamber pressure



No.	Testing/Test condition	Test specification
7	Rate of flow, KE restriction:	130...150 cm^3 /min
8	Temperature sensor, air (NTC I): Air temperature +15...+30°C:	 1,3...3,6 k Ω
9	Temperature sensor, engine (NTC II): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	 1,3...3,6 k Ω 250...390 Ω
10	Idle-mixture-adjusting screw basic setting: Fuel-distributor seat - needle bearing:	 22,6...22,8 mm
11	Idle adjustment: Low-idle-speed control (non-Bosch product). For testing, engine at norm. op. temperature. Idle speed: Idle-actuator current at idle speed: Engage driving position, speed: CO concentration in exhaust gas: Adjustment at idle-mixture-adjusting screw. After adjustment, repeat measurement.	 600...700 min^{-1} 700...1000 mA 500...600 min^{-1} 1,0...2,0 % by vol.

SELF-DIAGNOSIS

All Daimler-Benz 8-cylinder engines have been equipped as of FD 552 with self-diagnosis using on-off ratio measurement.

Defective input signals of the KE-Jetronic control unit may be indicated at the lambda test output (diagnosis socket outlet, socket 3) using the lambda closed-loop control tester.

Short circuiting and breaks in lines are detected. Sporadically occurring faults (e.g. loose contact) are not detected. Output of the fault signals takes priority over output of the lambda closed-loop control signal.

The faults which can be indicated are not discussed in detail here, since the input signals of the KE-Jetronic control unit may be tested using the universal test adapter (rapid diagnosis chart).

However, should a constant on-off ratio be indicated when testing the lambda closed-loop control using on-off ratio measurement, the input signals of the KE-Jetronic control unit must be checked (rapid diagnosis chart).

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER
ETT 018.01 WITH KE3 ADAPTER LEAD
1 684 463 169 AND APPROPRIATE MULTITESTER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electric/electronic peripheral and control-unit functions of the the KE-Jetronic, inlcuding the lambda closed-loop control.

Important note on the rapid diagnosis chart:

The "Test conditions" column gives information as to in which test steps the control-unit plug must be connected/disconnected. Make absolutely certain that there is no current at the system when connecting or disconnecting, i.e. the ignition must be switched off and the electric safety circuit must not be short circuited.

The "Test connections" column provides information about the leads connected to the respective measuring path, referring to the assignment in the control-unit plug. Possibly necessary trouble-shooting is with regard to these leads.

A t t e n t i o n :

When carrying out the test, make sure that the trimming plug is in position 1.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
1	V	4	–	Int. resistance(R_i) pressure actuator	12–10	Disconnect control-unit lead plug.	20...30 Ω
2	V	5	–	Resistor NTC II (engine)	21– 2	Engine temperature +15°...+30° C: approx. +80° C :	1,3...3,6 k Ω 250...390 Ω
3	V	6	–	Resistor NTC I (intake air)	11– 2	Air temperature in area of NTC I: +15°...+30° C:	1,3...3,6 k Ω
4				Signal, altitude sensor		Connect control unit. Switch on ignition. Voltmeter connection to blue Ω sockets. Signal altitude-dependent: 0 meters (sea level): 500 meters: 1000 meters: 1500 meters: 2000 meters: 3000 meters:	Test step not applicable!
5	V	9	–	Throttle-valve switch, idle	13– 2	Switch off ignition. Disconnect control-unit lead plug. Throttle valve closed: open:	0...10 Ω > 1000 Ω
6	V	10	–	Throttle-valve switch, full load	5– 2	Throttle valve closed: fully open:	infinite Ω >5000 Ω
7	V	11	–	Microswitch idle linkage	24– 2	Throttle valve closed: open:	0...10 Ω infinite Ω
8	V	12	–	Ground, control unit	20– 2		——— Ω
9	V	13	–	Ground, pin 7	7– 2	Switch off ignition. Connect control unit.	0...10 Ω

Rapid diagnosis chart for universal test adapter ETT 018.01 (continued)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
10	| V	14	–	Trimming plug Mixture map	22– 2	Disconnect control-unit plug. Disconnect lead plug from air-flow sensor potentiometer and connect socket 1 of plug (in upper installation position) to engine ground. Trimming-plug position 1: 2: 3: 4: 5: 6: 7:	 50... 60 Ω 100...120 Ω 150...190 Ω 230...270 Ω 330...370 Ω 430...470 Ω 570...620 Ω
11	| V	15	–	Transmission switch (only automatic transmission)	13– 2	Connect air-flow sensor potentiometer. Selection lever position P, N: Driving position selected:	 0...10 Ω infinite Ω
12	5	–	–	TD signal	25– 2	Start engine (starting motor):	Voltage undefined
13	6	–	–	Control-unit supply	1– 2	Switch on ignition:	8...15 V
14	7	–	–	Idle actuator supply and continuity	3– 2	Switch on ignition:	— V
15	8	–	–	Tempomat signal	6– 2	Switch Tempomat operation:	— V
16	9	–	–	Air-conditioner cut-in signal	19– 2	Switch off ignition. Connect control unit. Start engine, switch on air conditioner. Temperature regulator = Minimum temperature	 — V
17	10	–	–	Supply, air-flow sensor potentiometer	18– 2	Switch on ignition:	4,35...5,35 V

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
18	11	–	–	Signal, air–flow sensor potentiometer	17– 2	Switch on ignition. Air–flow sensor plate in neutral position: Deflect air–flow sensor plate by hand, continuous voltage rise up to max.:	0 V 5,35 V
19	13	–	1	Temperature signal from control unit	9– 2	Switch on ignition. While actuating btn 1:	1,5...1,9 V
20	14	–	–	Consumption signal	4– 2	Start engine – idle: With regulation:	Voltage undefined Voltage change
21	–	–	–	Peak coil current	12–12	Switch on ignition:	–>FD —— : ——— mA FD 546–>: 60...80 mA
22	–	–	1	Warm–up enrichment +20°C	12–12	Warm up engine – idle. Current value with btn 1 pressed:	–>FD —— : ——— mA FD 546–>: 7...11 mA
23	–	24	2	Actuator current Engine at norm. op. temp.	12–12	Engine at normal operating temperature, idle. Current value with btn 2 pressed;	–>FD —— : ——— mA FD 545–>: 1... 5 mA
24	–	21	1	Starting enrichment	12–12	So that engine fails to start: Disconnect speed relay for electric fuel pump. Short circuit ignition coil term. 4 to ground via resistance of at least 2k Ω . (E.g. with sleeve–type suppressor and spark gap) While btn 1 pressed, actuate starting motor. Current rise (max. 1 s.) to:	–>FD —— : ——— mA FD 546–>: 100...130 mA

FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

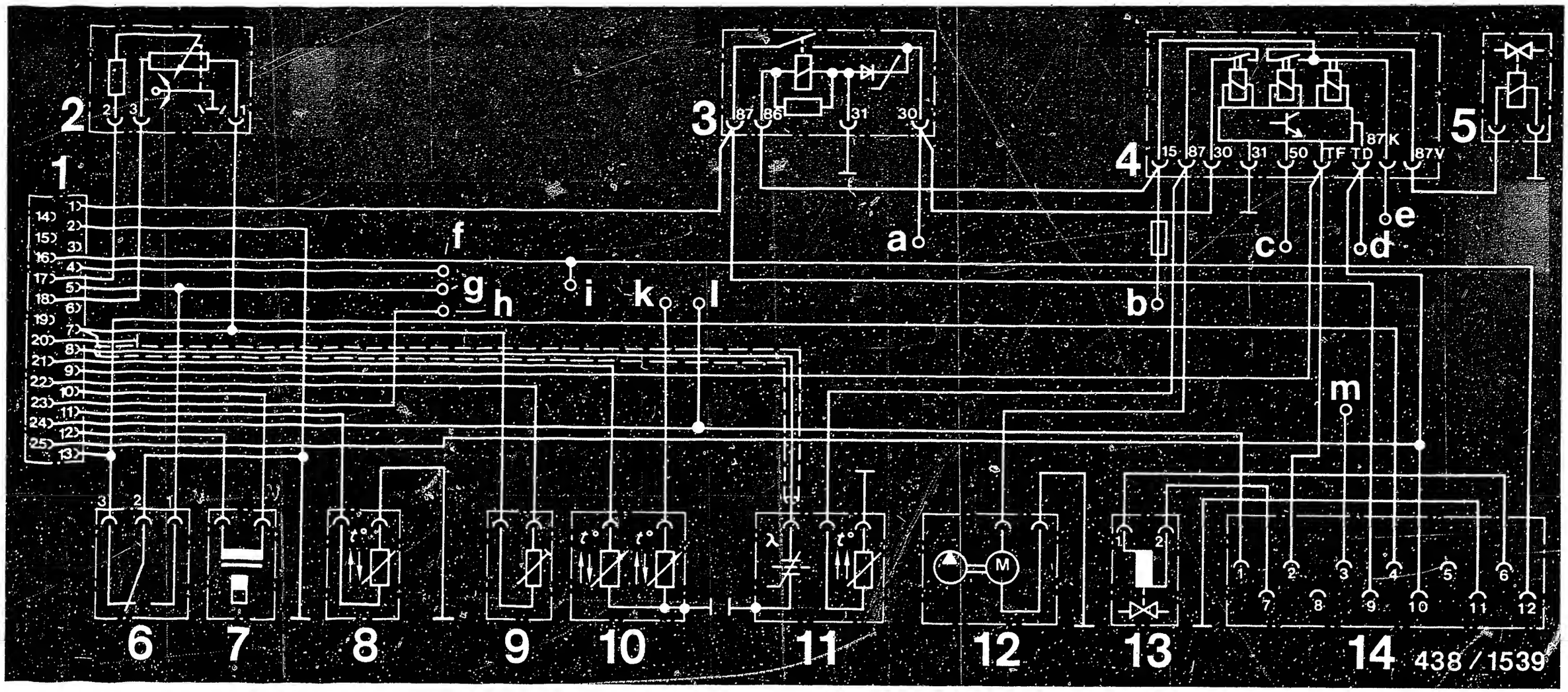
No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
25	–	21	1	Post-start enrichment	12-12	Start engine (at normal operating temperature) while actuating btn 1. Current value: Current value constant for approx: Then slow speed regulation to:	 ->FD ——: ——— mA FD 546 ->: 15...25 mA ->FD ——: ——— s FD 546 ->: 4... 9 s ->FD ——: ——— mA FD 546 ->: 7...11 mA
26	–	21	1	Acceleration enrichment	12-12	Engine at normal operating temperature, idle. While actuating btn 1, perform snap acceleration of engine. Thus current rise (approx. 1 s) to: Note: Level of current value dependent upon intensity of acceleration (travel/duration of air-flow sensor flap movement).	 ->FD ——: ——— mA FD 546 ->: 55...75 mA
27	–	–	–	Overrun cut-off	12-12	Re-connect ammeter (swap positive and negative) Start engine (normal operating temperature). Speed n to approx.: Hold there. Manually actuate idle throttle-valve switch (for 4- and 6-cyl. engines, microswitch at accelerator linkage). Engine hunts. Current reading during falling speed phase:	 ->FD ——: ——— min $^{-1}$ FD 546 ->: 1800 min $^{-1}$ -40...-80 mA

*) FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01

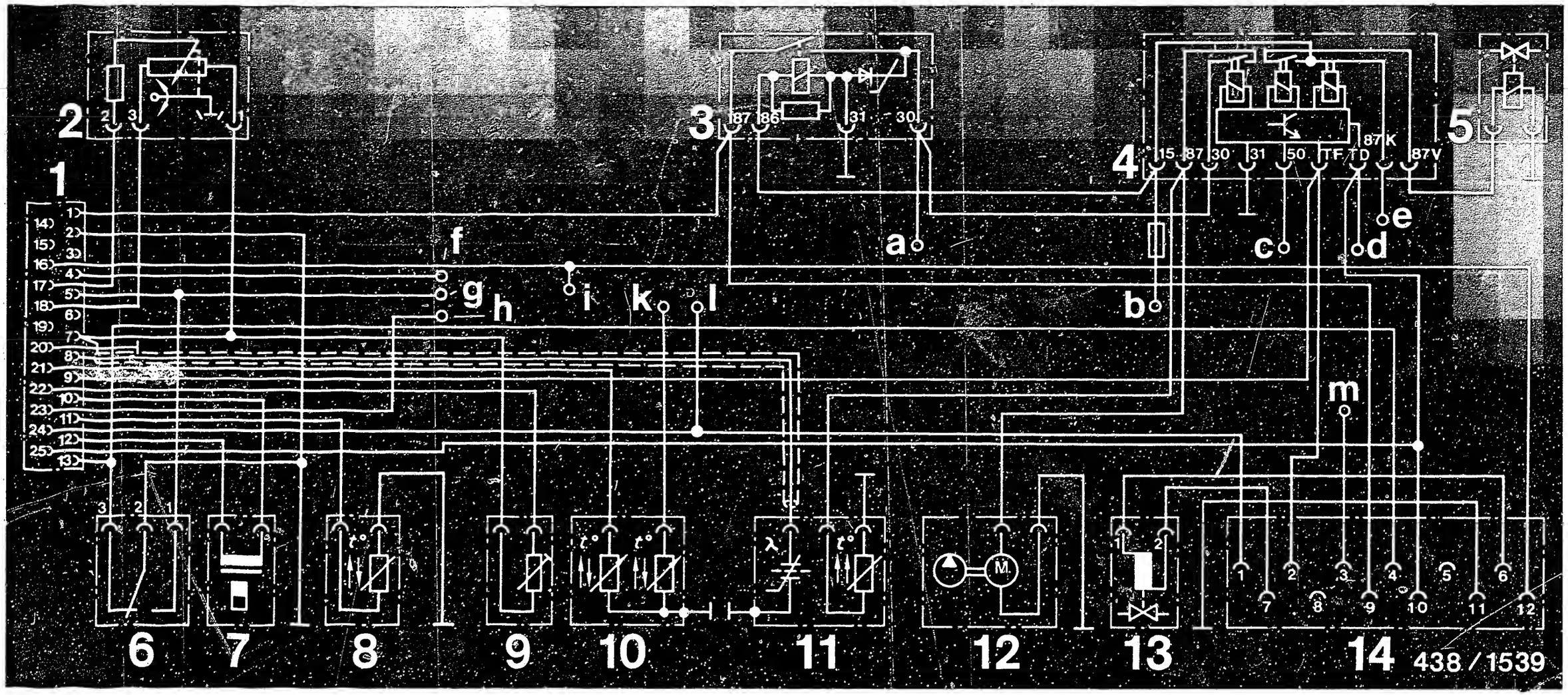
No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specification
28	–	24	–	Full-load enrichment	12-12	Engine at normal operating temperature, idle. Current value: Briefly push accelerator pedal to floor (full-load throttle-valve switch must switch). During speed rise, current value rises by: A t t e n t i o n: Do this very briefly, so that speed does not rise too much and engine is not damaged.	 ->FD ——— : ——— mA FD 546->: 1... 5 mA ->FD ——— : ——— mA FD 546->: 3... 6 mA

*) FD = Date of manufacture



1 = Control unit, KE-Jetronic
2 = Air-flow sensor potentiometer
3 = Over-voltage protection relay
4 = Electronic relay
5 = Cold-start valve
6 = Throttle-valve switch, idle/full load
7 = Electro-hydraulic pressure actuator
8 = Temperature sensor, intake air
9 = Trimming plug, mixture map
10 = Temperature sensor, engine (Double NTC)
11 = Heated lambda sensor
12 = Electric fuel pump
(2 pumps are installed, connected in parallel)
13 = Idle actuator (non-Bosch product)
14 = Control unit, low-idle-speed control
(non-Bosch product)

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT

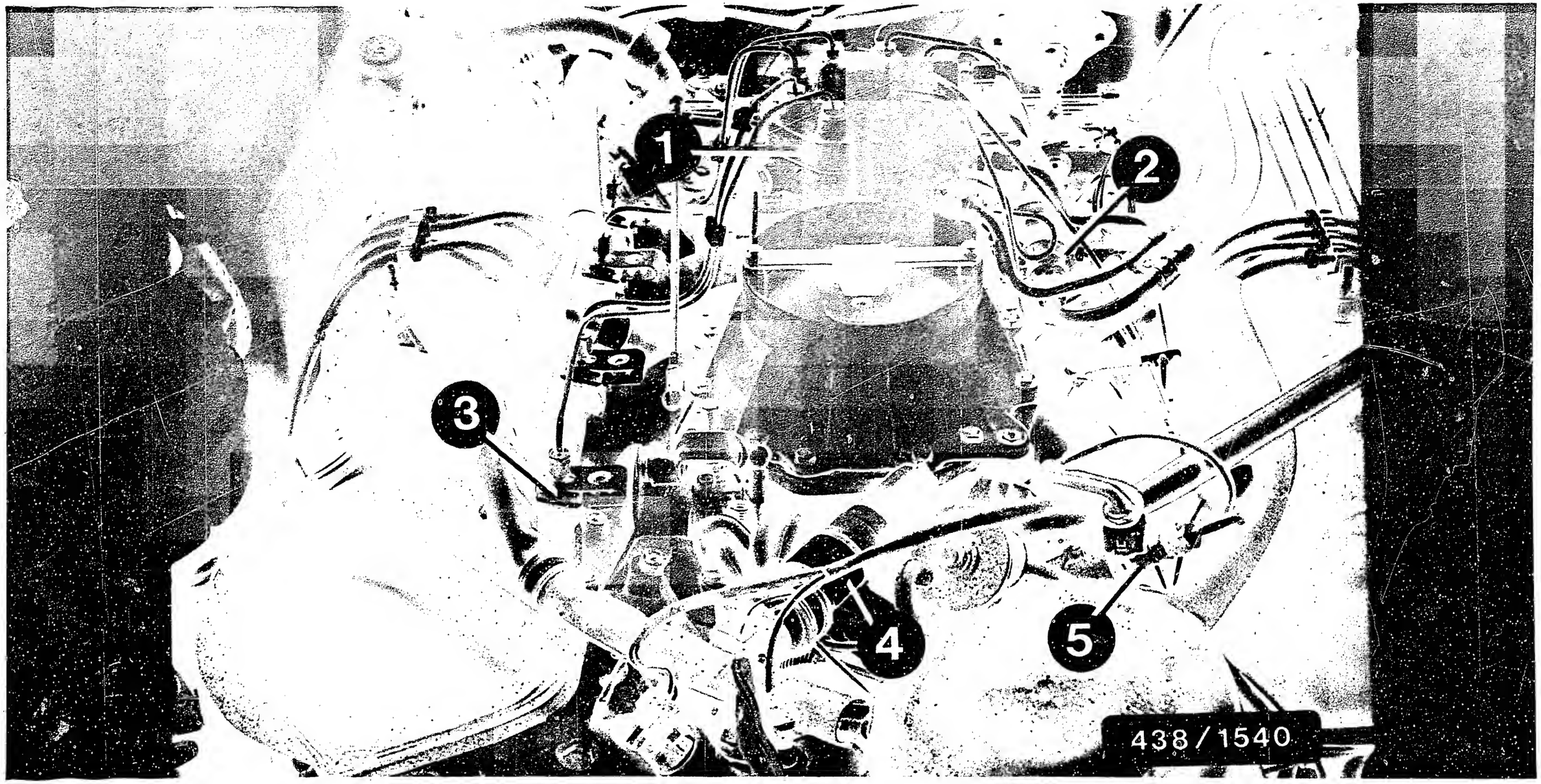


a = Terminal 30
b = Terminal 15 (fuse 7)
c = Plug connection, start-locking switch, socket 4
d = Terminal TD, ignition
e = Kick-down switch, socket 1
f = Plug connection, trip computer
g = Trigger box, ignition system
h = Lambda test output (diagnosis socket outlet, socket 3)
i = Plug connection, start-locking switch, socket 3
k = Trigger box, ignition system
l = Speed signal
m = Control unit, compressor cutoff

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT (CONTINUED)

B21 — <==>

B22 — <==



1 = Mixture-control unit
2 = Pressure regulator
3 = Injection valve
4 = Idle actuator (non-Bosch product)
5 = Cold-start valve

INSTALLATION POSITION OF COMPONENTS

Installation position of further components

KE-Jetronic control unit, trimming plug mixture map:
In footwell at right behind side panel.

Relay, electric fuel pump:
In engine compartment at left.

Relay, over-voltage protection:
In engine compartment at left.

Temperature sensor, engine (NTC II):
At left (referring to forward direction of travel) at rear at cylinder head.

For production reasons:
continued on the following coordinate.

T A B L E O F C O N T E N T S

Trouble-shooting instructions : MB-5013

BOSCH system : KE 3.1 – Jetronic

Make of vehicle : Mercedes-Benz

Basic microcard : PKW-014

Test instructions	Coordinates
Special features	C02
Self-diagnosis / Rapid diagnosis chart	C07–C18
Test specifications	C03–C06
Electrical terminal diagram	C19–C22
Electrical wiring diagram	
Hydraulic-lines diagram	
Diagram of air / fuel lines	
Tools and test equipment	
Testing and adjustment instructions	
Installation position of components	C23–C25
Notes on removal and installation	
General important information	

Tests without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* This microcard contains the trouble-shooting instructions, valid at the time of publication, for the following Mercedes-Benz model:

  560 SEL/SEC/SL, 5,6l/8Zyl. US/J/AUS 09.85->

* Trouble-shooting with these instructions may only then take place when the details of the "Summary – Service Information for Vehicles" (KFZ-000) coincide with those of the vehicle type and with the BOSCH number of KE-Jetronic control unit installed.

* Control unit using digital techniques, characteristic-map control using microprocessor.

* Electronically controlled low-idle-speed control with single-winding rotary actuator, without bypass adjusting screw.

* Activated-carbon filter and regeneration valve for return of gasoline vapors into the intake manifold. (Fuel evaporation system)

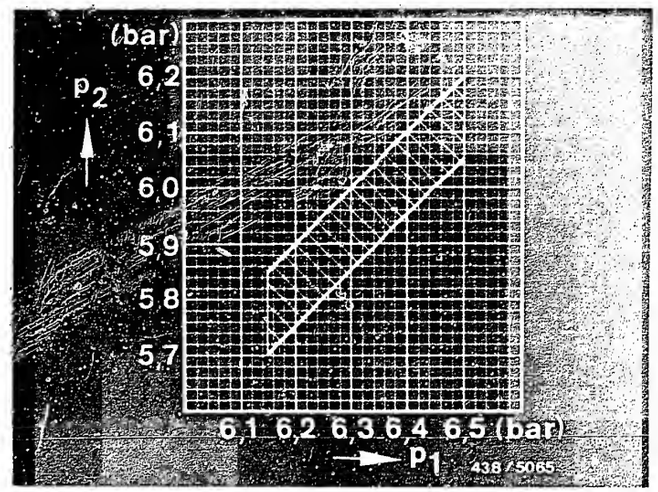
* Secondary-air injection

Important note:

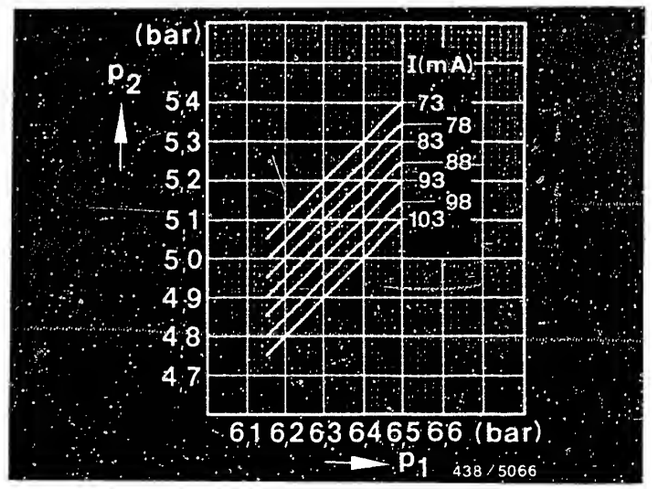
If reference is made to a basic microcard, always make certain you use the test specifications from the vehicle-specific brief instructions.

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification	
1	Electric fuel pump – fuel delivery:	At least 1750 cm ^{3} /min	
2	Primary pressure:	6,15...6,5 bar	
3	Differential pressure: Suppression of peak coil current: Actuate starting motor with fuel-pump relay disconnected. Do not switch off ignition after starting. Take lower-chamber pressure set value "warm" from top chart corresponding to primary pressure measured. (Actuator current 0 mA) Take lower-chamber pressure set value "cold" from bottom chart corresponding to primary pressure measured and actuator current. Tolerance ± 0.15 bar. Simulation of "cold" state: press push-button 3 at test adapter.		
4	Leakage test, complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 3,3 bar 3,2 bar	
5	Injection valves, opening pressure:	3,7...4,8 bar	
6	Fuel deliveries, comparative measurement: (Actuator current 0 mA)	Setting point: (cm ^{3} /min)	Max. permis. delivery: (cm ^{3} /min)
	Idle: Part load: Full load:	6,0 40,0 100,0	6,8 42,5 109,0
	Min. delivery at max. air-flow sensor plate defl.:	140,0 cm ^{3} /min	



p 1 = Primary pressure
p 2 = Lower-chamber pressure



C03 —— ⟹

C04 —— ⟸⟹

TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
7	Rate of flow, KE restriction:	130...150 cm^3 /min
8	Temperature sensor, air (NTC I): Air temperature +15...+30°C:	—— k Ω
9	Temperature sensor, engine (NTC II): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	 1,3...3,6 k Ω 250...390 Ω
10	Idle-mixture-adjusting screw basic setting: Fuel-distributor seat - needle bearing:	 22,6...22,8 mm
11	Idle adjustment: Low-idle-speed control (non-Bosch product). For testing, engine at norm. op. temperature Idle speed: Idle-actuator current at idle speed: Engage driving position, speed: Check lambda closed-loop control: Measurement with lambda closed-loop control tester (e.g. KDJE-P 600) and adapter lead (e.g. KDJE-P 600/52) at diagnosis socket outlet (pin 3). Alternatively: Current measurement using universal test adapter. Put fuel evaporation system out of operation. Determine on/off ratio (mean value) at n = 2500 min^{-1} . Deviation of on/off ratio (mean value) at idle compared to n = 2500 min^{-1} : Adjustment at idle-mixture-adjusting screw. After adjustment, repeat measurement.	 600...700 min^{-1} 700...1000 mA 500...600 min^{-1} +5...+15 %

SELF-DIAGNOSIS

All Daimler-Benz 8-cylinder engines have been equipped as of FD 552 with self-diagnosis using on-off ratio measurement.

Defective input signals of the KE-Jetronic control unit may be indicated at the lambda test output (diagnosis socket outlet, socket 3) using the lambda closed-loop control tester.

Short circuiting and breaks in lines are detected. Sporadically occurring faults (e.g. loose contact) are not detected. Output of the fault signals takes priority over output of the lambda closed-loop control signal.

The faults which can be indicated are not discussed in detail here, since the input signals of the KE-Jetronic control unit may be tested using the universal test adapter (rapid diagnosis chart).

However, should a constant on-off ratio be indicated when testing the lambda closed-loop control using on-off ratio measurement, the input signals of the KE-Jetronic control unit must be checked (rapid diagnosis chart).

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 WITH KE3 ADAPTER LEAD 1 684 463 169 AND APPROPRIATE MULTITESTER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electric/electronic peripheral and control-unit functions of the the KE-Jetronic, inlcuding the lambda closed-loop control.

Important note on the rapid diagnosis chart:

The "Test conditions" column gives information as to in which test steps the control-unit plug must be connected/disconnected. Make absolutely certain that there is no current at the system when connecting or disconnecting, i.e. the ignition must be switched off and the electric safety circuit must not be short circuited.

The "Test connections" column provides information about the leads connected to the respective measuring path, referring to the assignment in the control-unit plug. Possibly necessary trouble-shooting is with regard to these leads.

A t t e n t i o n :

When carrying out the test, make sure that the trimming plug is in position 1.

Rapid diagnosis chart for universal test adapter ETT 018.01 (continued)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
1	V	4	–	Internal resistance (R_i) pressure actuator	12–10	Disconnect control-unit plug.	20...30 Ω
2	V	5	–	Resistance, temperature sensor (coolant)	21– 2	Engine temperature +15...30°C: approx. +80°C:	1,3...3,6 k Ω 250...390 Ω
3				Resistance, temperature sensor (intake air)		Air temperature in area of NTC I = +15...+30°C:	Test step not applicable
4	V	6	–	Signal, altitude sensor	11– 2	Connect control unit. Switch on ignition. Voltmeter connection to blue Ω sockets. Signal altitude-dependent: 0 meters (sea level): 500 meters: 1000 meters: 1500 meters: 2000 meters: 3000 meters:	 3,2...4,5 V 2,8...4,0 V 2,4...3,5 V 2,0...3,0 V 1,5...2,5 V 0,8...1,6 V
5	V	9	–	Throttle-valve switch, idle	13– 2	Switch off ignition. Disconnect control-unit lead plug. Throttle valve closed: open:	 0...10 Ω > 1000 Ω
6	V	10	–	Throttle-valve switch, full load	5– 2	Throttle valve closed: fully open:	Ω 0...10 Ω
7	V	11	–	Microswitch idle linkage	24– 2	Throttle valve closed: open:	——— Ω infinite Ω
8	V	12	–	Ground, control unit	20– 2		0...10 Ω
9	V	13	–	Ground, pin 7	7– 2	Switch of f ignition. Connect control unit.	 0...10 Ω

Rapid diagnosis chart for universal test adapter ETT 018.01 (continued)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
10	| V	14	–	Trimming plug Mixture map	22– 2	Disconnect control-unit plug. Disconnect lead plug from air-flow sensor potentiometer and connect socket 1 of plug (in upper installation position) to engine ground. Trimming-plug position 1: 2: 3: 4: 5: 6: 7:	 0...10 Ω ——— Ω ——— Ω ——— Ω ——— Ω ——— Ω ——— Ω
11	| V	15	–	Transmission switch (only automatic transmission)	16– 2	Connect air-flow sensor potentiometer. Selection lever position P, N: Driving position selected:	 0...10 Ω infinite Ω
12	5	–	–	TD signal	25– 2	Start engine (starting motor):	Voltage undefined
13	6	–	–	Control-unit supply	1– 2	Switch on ignition:	8...15 V
14	7	–	–	Idle actuator supply and continuity	3– 2	Switch on ignition:	——— V
15	8	–	–	Tempomat signal	6– 2	Switch Tempomat operation:	——— V
16	9	–	–	Air-conditioner cut-in signal	19– 2	Switch off ignition. Connect control unit. Start engine, switch on air conditioner. Temperature regulator = Minimum temperature	 ——— V
17	10	–	–	Supply, air-flow sensor potentiometer	18– 2	Switch on ignition:	4,35...5,35 V

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
18	11	–	–	Signal, air-flow sensor potentiometer	17– 2	Switch on ignition. Air-flow sensor plate in neutral position: Defect air-flow sensor plate by hand, continuous voltage rise up to max.:	0 V 5,35 V
19	13	–	1	Temperature signal form control unit	9– 2	Switch on ignition. While actuating btn 1:	1,5...1,9 V
20	14	–	–	Consumption signal	4– 2	Start engine – idle: With regulation:	Voltage indefined Voltage change
21	–	–	–	Peak coil current	12–12	Switch on ignition:	–>FD ——: ——— mA FD 545 –>: 65...85 mA
22	–	–	1	Warm-up enrichment + 20°C	12–12	Warm up engine – idle. Current value with btn 1 pressed:	–>FD 549: 8...12 mA FD 550 –>: 3... 5 mA
23	–	24	2	Actuator current Engine at norm. op. temp.	12–12	Engine at norm. op. temp., idle. Current value with btn 2 pressed; reading oscillating, mean value:	–>FD ——: ——— mA FD 545 –>: –1...+1 mA
24	–	21	1	Starting enrichment	12–12	So that engine fails to start: Disconnect speed relay for electric fuel pump. Short circuit ignition coil term. 4 to ground via resistance of at least 2 k Ω . (e.g. with sleeve-type suppressor and spark gap) While btn 1 pressed, actuate starting motor. Current rise (max. 1 sec.) to:	–>FD ——: ——— mA FD 545 –>: 120...150 mA

*) FD = Date of manufacture

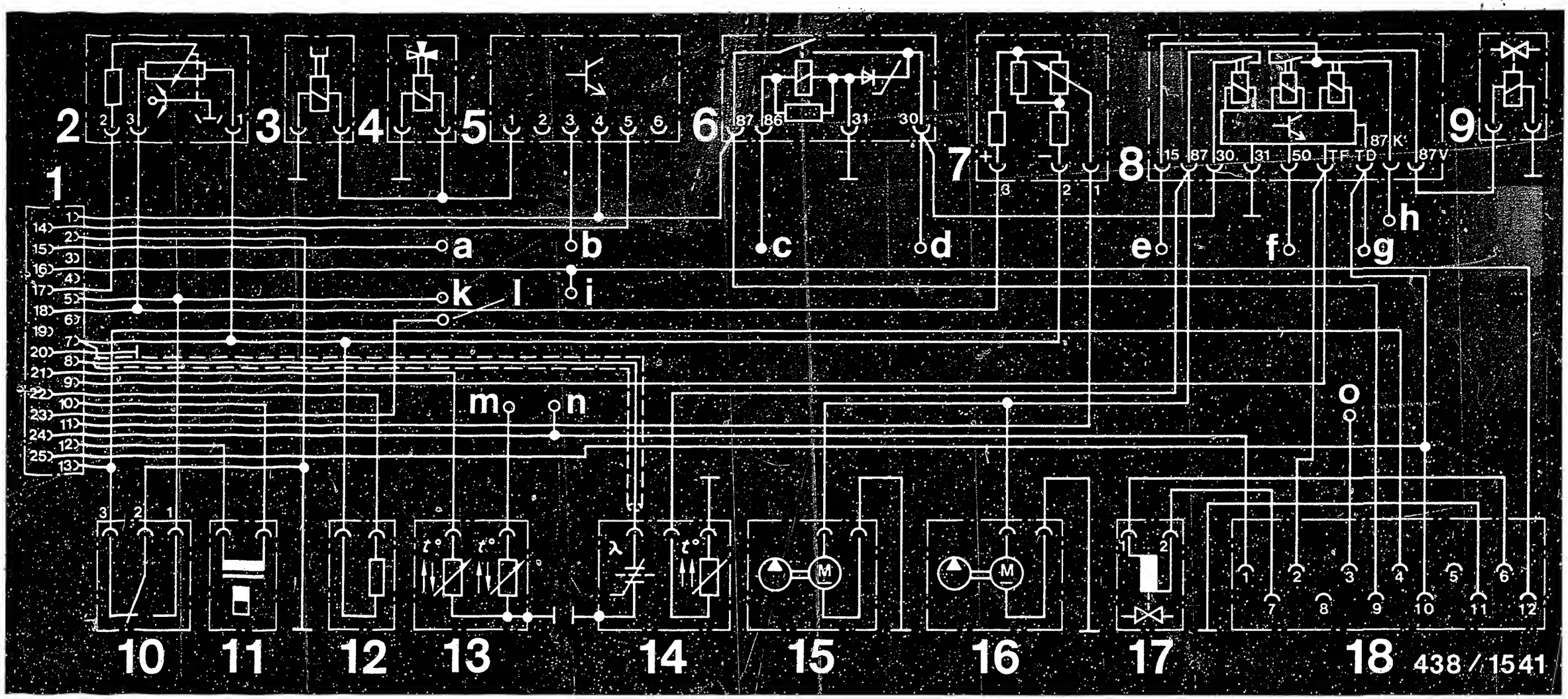
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
25	–	21	1	Post-start enrichment	12–12	Start engine (at normal operating temperature) while actuating btn 1. Current value: Current value constant for approx: Then slow speed regulation to:	 ->FD 549: 40...50 mA FD 550 ->: 30...40 mA ->FD 549: 3... 9 s FD 550 ->: 10...16 s ->FD 549: 8...12 mA FD 550 ->: 3... 5 mA
26	–	21	1	Acceleration enrichment	12–12	Engine at normal operating temperature, idle. While actuating btn 1, perform snap acceleration of engine. Thus current rise (approx. 1 s) to: Note: Level of current value dependent upon intensity of acceleration (travel/duration of air-flow sensor flap movement).	 ->FD ——: ——— mA FD 545 ->: 50...70 mA
27	–	–	–	Overrun cut-off	12–12	Re-connect ammeter (swap positive and negative) Start engine (normal operating temperature). Speed n to approx.: Hold there. Manually actuate idle throttle-valve switch (for 4- and 6-cyl. engines, microswitch at accelerator linkage). Engine hunts. Current reading during falling speed phase:	 ->FD ——: ——— min $^{-1}$ FD 545 ->: 1700 min $^{-1}$ –40...–80 mA

*) FD = Date of manufacture

No.	Switch/Btn V	Switch/Btn Ω	Switch/Btn Btn	Under test	Test pins	Test conditions	Test specification CAT
28	–	24	–	Full-load enrichment	12-12	Engine at normal operating temperature, idle. Reading oscillating, mean value: Briefly push accelerator pedal to floor (full-load throttle-valve switch must switch). During speed rise, current value rises by: A t t e n t i o n: Do this very briefly, so that speed does not rise too much and engine is not damaged.	 ->FD ——: ——— mA FD 545 ->: -1...+1 mA ->FD ——: ——— mA FD 545 ->: 3... 6 mA
29	–	21	–	Lambda closed-loop control, open-loop control mode	12-12	Disconnect regeneration lead to throttle-valve assembly at generation valve and seal. Engine at norm. op. temp., idle. Current value:	 -1...+1 mA
30	–	24	–	Lambda closed-loop control, closed-loop control mode	12-12	Engine at norm. op. temp., idle. Closed-loop control mode can be recognized from the oscillating current reading. Mean value: If mean value outside tolerance, set (idle-mixture-adjusting screw) to approx.:	 -1...+1 mA 0 mA
31	–	22	–	Lambda closed-loop control, rich stop	12-12	Engine at norm. op. temp., idle. Current rise to:	 10...14 mA
32	–	23	–	Lambda closed-loop control, lean stop	12-12	Engine at norm. op. temp., idle. Current drop to:	 -10...-14 mA

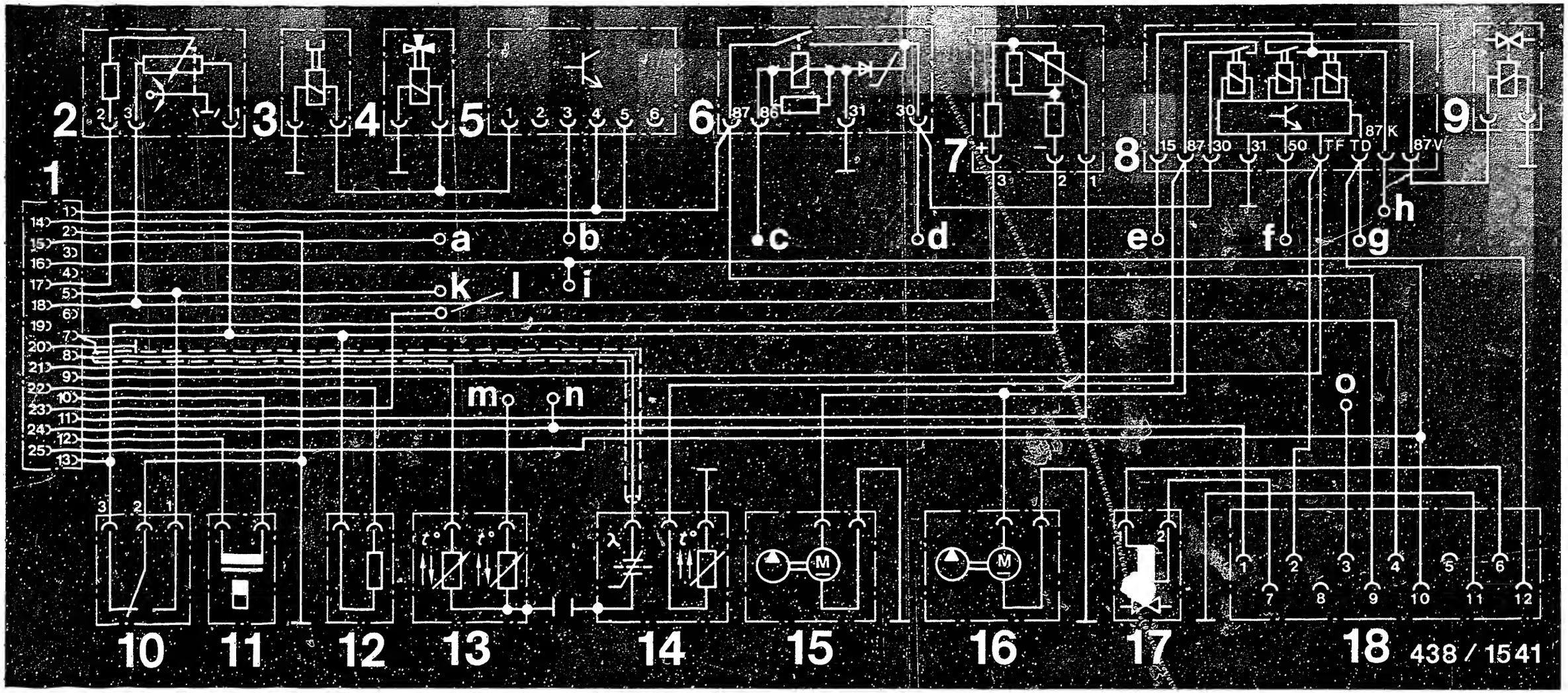
*) FD = Date of manufacture



1 = Control unit, KE-Jetronic
2 = Air-flow sensor potentiometer
3 = Electro-magnetic coupling, air pump
4 = Change-over valve, air pump
5 = Relay, air injection
6 = Over-voltage protection relay
7 = Altitude sensor
8 = Electronic relay
9 = Cold-start valve
10 = Throttle-valve switch, idle/full load
11 = Electro-hydraulic pressure actuator
12 = Trimmer resistor, mixture map
13 = Temperature sensor, coolant (Double NTC)
14 = Heated lambda sensor
15 = Electric fuel pump
16 = Electric fuel pump
17 = Idle actuator (non-Bosch product)
18 = Control unit, low-idle-speed control (non-Bosch product)

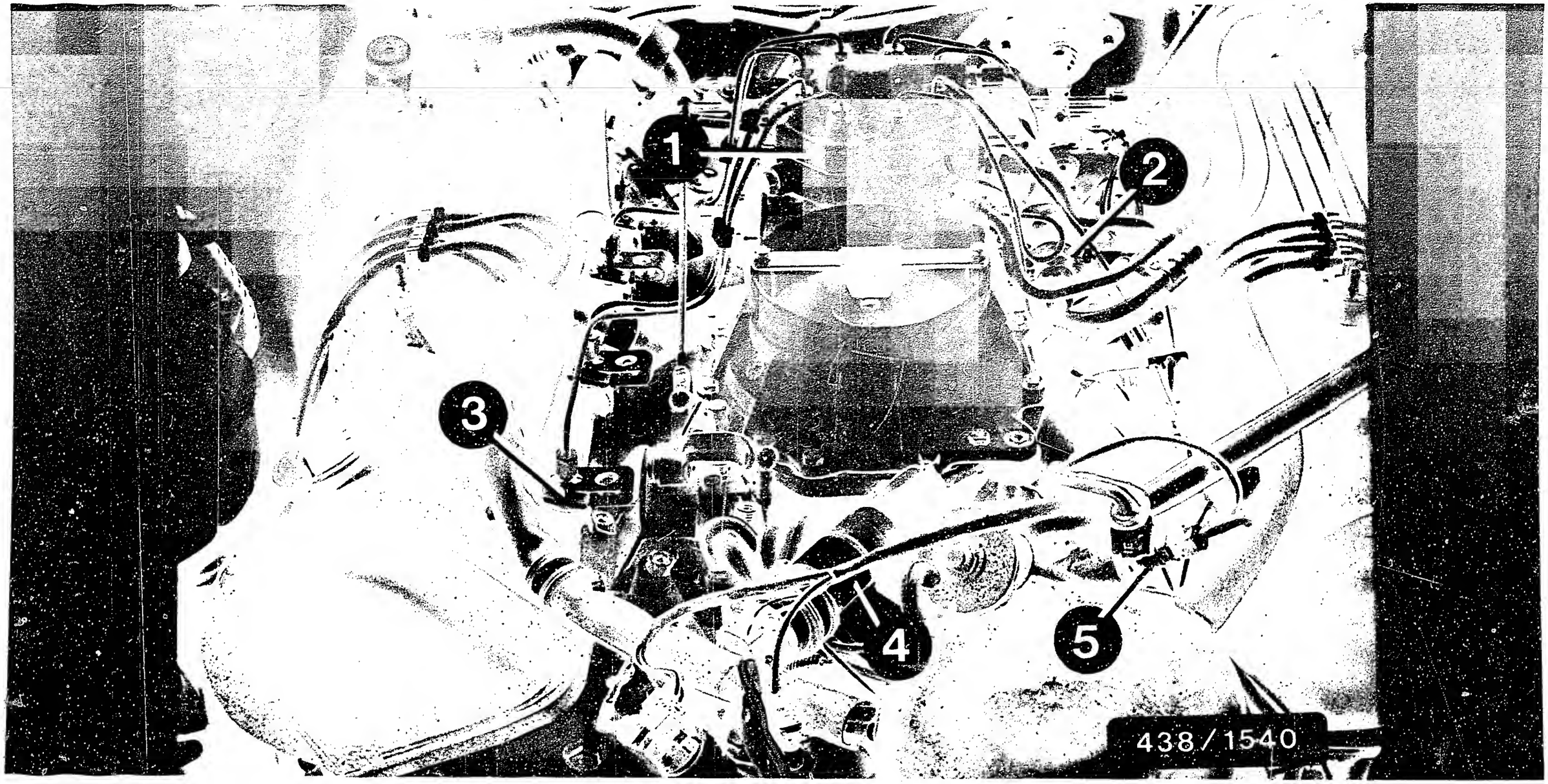
ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT

C19 ⟹
C20 ⟺



a = Lambda malfunction indicator
b = Terminal 15
c = Terminal 15
d = Terminal 30
e = Terminal 15
f = Plug connection, start-locking switch, socket 4
g = Terminal TD, ignition
h = Kick-down switch, socket 1
i = Plug connection, start-locking switch, socket 3
k = Trigger box, ignition system
l = Lambda test output (diagnosis socket outlet, socket 3)
m = Trigger box, ignition system
n = Speed signal
o = Control unit, compressor cutoff

Electrical terminal diagram with electric fuel pump safety circuit (continued)



1 = Mixture–control unit
2 = Pressure regulator
3 = Injection valve
4 = Idle actuator (non–Bosch product)
5 = Cold–start valve

INSTALLATION POSITION OF COMPONENTS

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

KE-Jetronic control unit:
In Type 126, in footwell at right behind side panel,
in Type 107, in footwell at right beneath floor panel.

Relay, electric fuel pump:
In Type 126, in engine compartment at left,
in Type 107, behind glove compartment.

Relay, over-voltage protection:
In Type 126, in engine compartment at left,
in Type 107, in footwell at right behind side panel.

Temperature sensor, engine (NTC II):
At left (referring to forward direction of travel) at rear at cylinder head.

For production reasons:
continued on the following coordinate.

C25 — <==

C26 — => <=

T A B L E O F C O N T E N T S

Trouble-shooting instructions : MB-5014

BOSCH system : KE 3.1-Jetronic

Make of vehicle : Mercedes-Benz

Basic microcard : PKW-014

Test instructions	Coordinates
Special features	D02
Self-diagnosis / Rapid diagnosis chart	D07-D18
Test specifications	D03-D06
Electrical terminal diagram	D19-D22
Electrical wiring diagram	
Hydraulic-lines diagram	
Diagram of air / fuel lines	
Tools and test equipment	
Testing and adjustment instructions	
Installation position of components	D23-D26
Notes on removal and installation	
General important information	

Tests without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* These instructions contain the KE 3.1-Jetronic trouble-shooting instructions, valid at the time of publication, for the following Mercedes-Benz model:
  420 SE/SEL/SEC, 4,2 1/8Zyl. 09.85->
  420 SL, 4,2 1/8Zyl. 01.86->

* Trouble-shooting with these instructions may only then take place when the details of the "Summary - Service Information for Vehicles" (KFZ-000) coincide with those of the vehicle type and with the BOSCH number of the KE-Jetronic control unit installed.

* Control unit using digital techniques, characteristic-map control using microprocessor.

* Multi-functional fuel-management system with a characteristic map for operation with lambda closed-loop control (CAT) and a characteristic map for operation without lambda closed-loop control (ECE). Activation of the characteristic maps by trimming plug with corresponding marking. To set to the fuel grades unleaded regular and unleaded premium, only the ignition trimming plug must be re-connected.

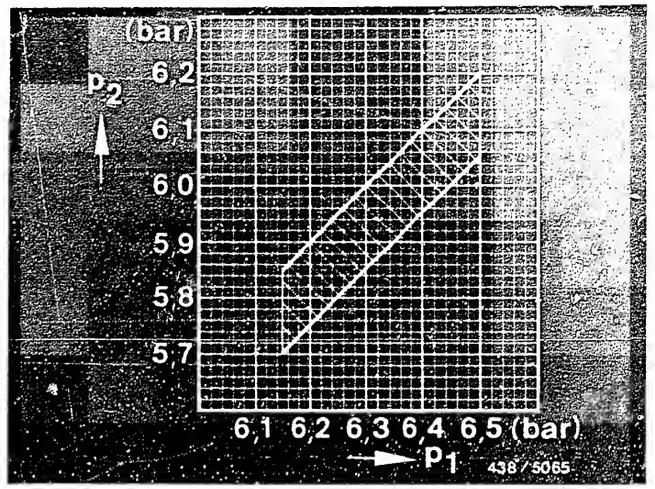
* Electronically controlled idle-speed control with single-winding rotary actuator, without bypass adjusting screw.

* Activated-carbon filter and regeneration valve for return of gasoline vapors into the intake manifold. (Fuel evaporation system)

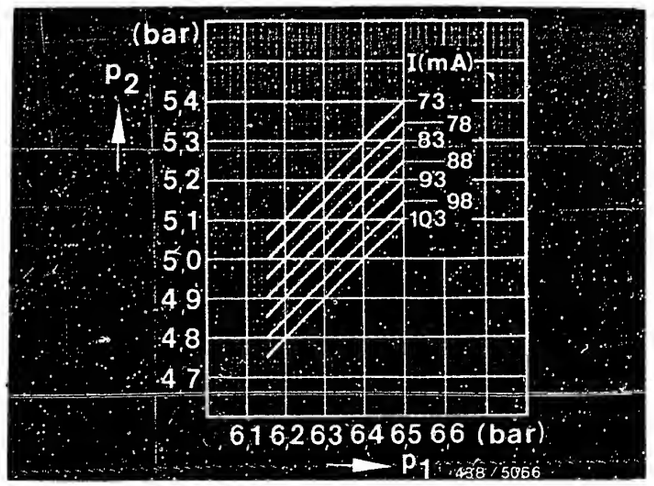
* Secondary air injection (only in CAT version)

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification	
1	Electric fuel pump – fuel delivery:	At least 1650 cm ^{3} /min	
2	Primary pressure:	6,15...6,5 bar	
3	Differential pressure: Suppression of peak coil current: Actuate starting motor with fuel-pump relay disconnected. Do not switch off ignition after starting. Take lower-chamber pressure set value "warm" from top chart corresponding to primary pressure measured. (Actuator current 0 mA) Take lower-chamber pressure set value "cold" from bottom chart corresponding to primary pressure measured and actuator current. Tolerance ± 0.15 bar. Simulation of "cold" state: press push-button 3 at test adapter.		
4	Leakage test, complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 3,3 bar 3,2 bar	
5	Injection valves, opening pressure:	3,7...4,8 bar	
6	Fuel deliveries, comparative measurement: (Actuator current 0 mA)	Setting point: (cm ^{3} /min)	Max. permis. delivery: (cm ^{3} /min)
	Idle: Part load: Full load:	6,0 40,0 100,0	6,6 42,5 109,0
	Min. delivery at max. air-flow sensor plate defl.:	140 cm ^{3} /min	



p 1 = Primary pressure
p 2 = Lower-chamber pressure



D03 ⟹

D04 ⟺

TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
7	Rate of flow, KE restriction:	130...150 cm^3 /min
8	Temperature sensor, air (NTC I): Air temperature +15...+30°C:	 1,3...3,6 k Ω
9	Temperature sensor, engine (NTC II): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	 1,3...3,6 k Ω 250...390 Ω
10	Idle-mixture-adjusting screw basic setting: Fuel-distributor seat - needle bearing:	 22,6...22,8 mm
11	Idle adjustment: Low-idle-speed control (non-Bosch product). For testing, engine at norm. op. temperature. Idle speed: Idle-actuator current at idle speed: Engage driving position, speed: <u>Only ECE</u>: CO concentration in exhaust gas: <u>Only CAT</u>: Check lambda closed-loop control: Measurement with lambda closed-loop control tester (e.g. KDJE-P 600) and adapter lead (e.g. KDJE-P 600/52) at diagnosis socket outlet (pin 3). Alternatively: Current measurement using universal test adapter. Put fuel evaporation system out of operation. Determine on/off ratio (mean value) at n = 2500 min^{-1} . Deviation of on/off ratio (mean value) at idle compared to n = 2500 min^{-1} : Adjustment at idle-mixture-adjusting screw. After adjustment, repeat measurement.	 600...700 min^{-1} 700...1000 mA 450...550 min^{-1} 1...2 % CO by vol. +5...+15 %

SELF-DIAGNOSIS

All Daimler-Benz 8-cylinder engines have been equipped as of FD 552 with self-diagnosis using on-off ratio measurement.

Defective input signals of the KE-Jetronic control unit may be indicated at the lambda test output (diagnosis socket outlet, socket 3) using the lambda closed-loop control tester.

Short circuiting and breaks in lines are detected. Sporadically occurring faults (e.g. loose contact) are not detected. Output of the fault signals takes priority over output of the lambda closed-loop control signal.

The faults which can be indicated are not discussed in detail here, since the input signals of the KE-Jetronic control unit may be tested using the universal test adapter (rapid diagnosis chart).

However, should a constant on-off ratio be indicated when testing the lambda closed-loop control using on-off ratio measurement, the input signals of the KE-Jetronic control unit must be checked (rapid diagnosis chart).

RAPID DIAGNOSIS CHART TO UNIVERSAL TEST ADAPTER ETT 018.01 WITH KE3 ADAPTER LEAD 1 684 463 169 AND APPROPRIATE MULTITESTER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electric/electronic peripheral and control-unit functions of the KE-Jetronic, including the lambda closed-loop control.

Important note on the rapid diagnosis chart:

The "Test conditions" column gives information as to in which test steps the control-unit plug must be connected/disconnected. Make absolutely certain that there is no current at the system when connecting or disconnecting, i.e. the ignition must be switched off and the electric safety circuit must not be short circuited.

The "Test connections" column provides information about the leads connected to the respective measuring path, referring to the assignment in the control-unit plug. Possibly necessary trouble-shooting is with regard to these leads.

The "Test specifications" column contains the test specifications for both the version without lambda closed-loop control (ECE, left-hand test-specifications column) and for the version with lambda closed-loop control (CAT, right-hand test-specifications column). Before starting testing, determine which version is being tested. If only one test specification is given, this applies to both versions.

Attention: When carrying out the test, make sure that the trimming plug is in position 1.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Switch/Btn Ω	Switch/Btn Btn	Under test	Test pins	Test conditions	Test specifications
1	| V	4	–	Int. resistance(R_i) pressure actuator	12–10	Disconnect control-unit lead plug.	20...30 Ω
2	| V	5	–	Resistor NTC II (engine)	21– 2	Engine temperature +15°...+30° C: approx. +80° C :	1,3...3,6 k Ω 250...390 Ω
3	| V	6	–	Resistor NTC I (intake air)	11– 2	Air temperature in area of NTC I: +15°...+30° C:	1,3...3,6 k Ω
4				Signal, altitude sensor		Connect control unit. Switch on ignition. Voltmeter connection to blue Ω sockets. Signal altitude-dependent: 0 meters (sea level): 500 meters: 1000 meters: 1500 meters: 2000 meters: 3000 meters:	Test step not applicable!
5	| V	9	–	Throttle-valve switch, idle	13– 2	Switch off ignition. Disconnect control-unit lead plug. Throttle valve closed: open:	0...10 Ω > 1000 Ω
6	| V	10	–	Throttle-valve switch, full load	5– 2	Throttle valve closed: fully open:	infinite Ω > 5000 Ω
7	| V	11	–	Microswitch idle linkage	24– 2	Throttle valve closed: open:	0...10 Ω infinite Ω
8	| V	12	–	Ground, control unit	20– 2		——— Ω
9	| V	13	–	Ground, pin 7	7– 2	Switch off ignition. Connect control unit.	0...10 Ω

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications ECE	CAT
10	| V	14	–	Trimming plug mixture map	22– 2	Disconnect control-unit lead plug. Disconnect lead plug from air-flow sensor potentiometer and connect socket 1 of plug (in upper installation position) to engine ground. Trimming-plug position 1:	50... 60 Ω	900... 1020 Ω
						2:	100... 120 Ω	1200... 1350 Ω
						3:	150... 190 Ω	1500... 1750 Ω
						4:	230... 270 Ω	2000... 2400 Ω
						5:	330... 370 Ω	3000... 3600 Ω
						6:	430... 470 Ω	5000... 5600 Ω
						7:	570... 620 Ω	11000...12000 Ω
11	| V	15	–	Transmission switch (only automatic transmission)	16– 2	Connect air-flow sensor potentiometer. Selection lever posn. P, N:	0...10 Ω	
						Driving position selected:	infinite Ω	
12	5	–	–	TD signal	25– 2	Start eng. (starting motor):	Voltage undefined	
13	6	–	–	Control-unit supply	1– 2	Switch on ignition:	8...15 V	
14	7	–	–	Idle actuator supply and continuity	3– 2	Switch on ignition:	— V	
15	8	–	–	Tempomat signal	6– 2	Switch Tempomat operation:	— V	
16	9	–	–	Air-conditioner cut-in signal	19– 2	Switch off ignition. Connect control unit. Start engine, switch on air conditioner. Temperature regulator = minimum temperature:	— V	
17	10	–	–	Supply, air-flow sensor potentiometer	18– 2	Switch on ignition:	4,35...5,35 V	

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specificatons ECE	CAT
18	11	–	–	Signal, air–flow sensor potentiometer	17– 2	Switch on ignition. Air–flow sensor plate in neutral position: Deflect air–flow sensor plate by hand, continuous voltage rise up to max.:	0 V 5,35 V	
19	13	–	1	Temperature signal from control unit	9– 2	Switch on ignition. While actuating btn 1:	1,5...1,9 V	
20	14	–	–	Consumption signal	4– 2	Start engine – idle: With regulation:	Voltage indefined Voltage change	
21	–	–	–	Peak coil current	12–12	Switch on ignition:	–>FD —— : ——— mA FD 546–>: 60...80 mA	–>FD —— : ——— mA FD 546–>: 65...85 mA
22	–	–	1	Warm–up enrichment +20°C	12–12	Warm up engine – idle. Current value with btn 1 pressed:	–>FD —— : ——— mA FD 546–>: 7...11 mA	–>FD 641 : 8...12 mA FD 642–>: 3... 5 mA
23	–	24	2	Actuator current Engine at norm. op. temp.	12–12	Eng. at norm. op. temp., idle Current valve with btn 2 pressed: With CAT, oscillating, mean value:	–>FD —— : ——— mA FD 546–>: 2... 4 mA	–>FD —— : ——— mA FD 546–>: –1...+1 mA
24	–	21	1	Starting enrichment	12–12	So that eng. fails to start: Disconnect speed relay for elec. fuel pump. Short circuit ign. coil term.4 to grnd via resist. of at least 2k Ω (E.g. with sleeve–type suppressor and spark gap) While btn 1 pressed, actuate starting motor. Current rise (max. 1 s.) to:	–>FD —— : ——— mA FD 546–>: 100...130 mA	–>FD —— : ——— mA FD 546–>: 120...150 mA

FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

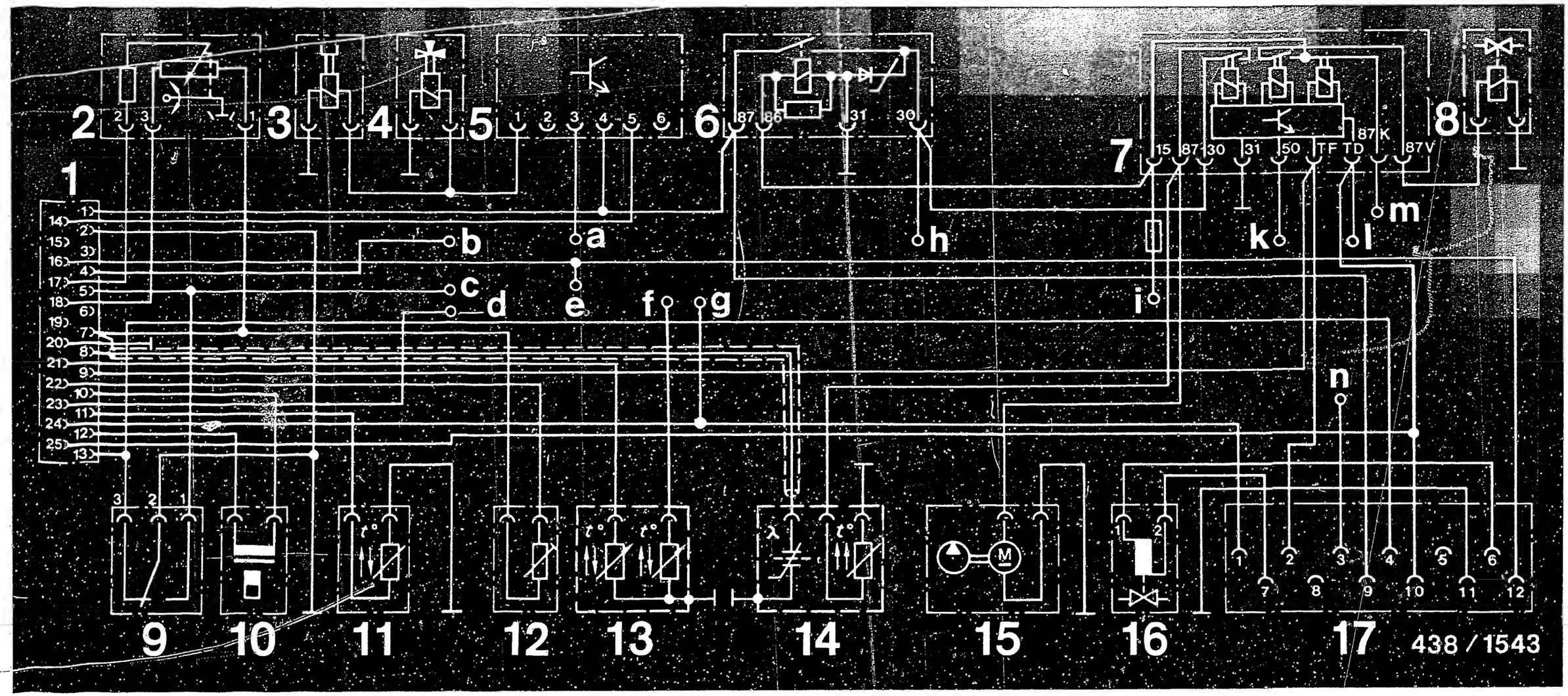
No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications ECE		CAT	
25	–	21	1	Post-start enrichment	12-12	Start engine (at normal op. temp.) while actuating btn 1. Current value: Current value const. for app. Then slow speed reg. to:	->FD —— FD 546->: ->FD —— FD 546->: ->FD —— FD 546->:	: ——— mA 15...25 mA : ——— s 4... 8 s : ——— mA 7...11 mA	->FD 641 FD 642->: ->FD —— FD 546->: ->FD 641 FD 642->:	: 40...50 mA 30...40 mA : ——— s 4... 8 s : 8...12 mA 3... 5 mA
26	–	21	1	Acceleration enrichment	12-12	Eng. at norm. op. temp., idle While actuating btn. 1, perform snap acceleration of eng Thus current rise (approx. 1 s) to: <u>Note:</u> Level of current value dependent upon intensity of acceleration (travel/ duration of air-flow sensor plate movement).	->FD —— FD 546->:	: ——— mA 60...80 mA	->FD —— FD 546->:	: ——— mA 50...70 mA
27	–	–	–	Overrun cut-off	12-12	Re-connect ohmmeter (swap positive and negative). Start eng. (norm. op. temp.). Speed n to approx.: Hold there. Manually actuate idle throttle-valve switch (for 4- and 6- cyl. eng. microswitch at accelerator linkage). Engine hunts. Current reading during falling speed phase:	->FD —— FD 546->: -40...-80 mA	: ——— min^{-1} 1800 min^{-1}	->FD —— FD 546->: -40...-80 mA	: ——— min^{-1} 1700 min^{-1}

FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications ECE	CAT
28	–	24	–	Full-load enrichment	12-12	Eng. at norm. op. temp., idle Current value (ECE): With CAT, oscil., mean value: Briefly push accelerator pedal to floor (full-load throttle-valve switch must switch). During speed rise, current value rises by: Attention: Do this very briefly, so that speed does not rise too much and engine is not damaged.	->FD —— : ——— mA FD 546->: 2... 4 mA ->FD —— : ——— mA FD 546->: 3... 6 mA	->FD —— : ——— mA FD 546->: -1...+1 mA ->FD —— : ——— mA FD 546->: 3... 6 mA
29	–	21	–	Lambda closed-loop control, open-loop control mode	12-12	Disconnect regeneration lead to throttle-valve assembly at regeneration valve and seal. Eng. at norm. op. temp., idle Current value:	——	-1...+1 mA
30	–	24	–	Lambda closed-loop control, closed-loop control mode	12-12	Eng. at norm. op. temp., idle Closed-loop control mode can be recognized from the oscillating current reading. Mean value: If mean value outside tolerance, set (idle-mixture-adjusting screw) to:	—— ——	-1...+1 mA approx. 0 mA
31	–	22	–	Lambda closed-loop control, rich stop	12-12	Eng. at norm. op. temp., idle Current rise to:	——	10... 14 mA
32	–	23	–	Lambda closed-loop control, lean stop	12-12	Eng. at norm. op. temp., idle Current drop to:	——	-10...-14 mA

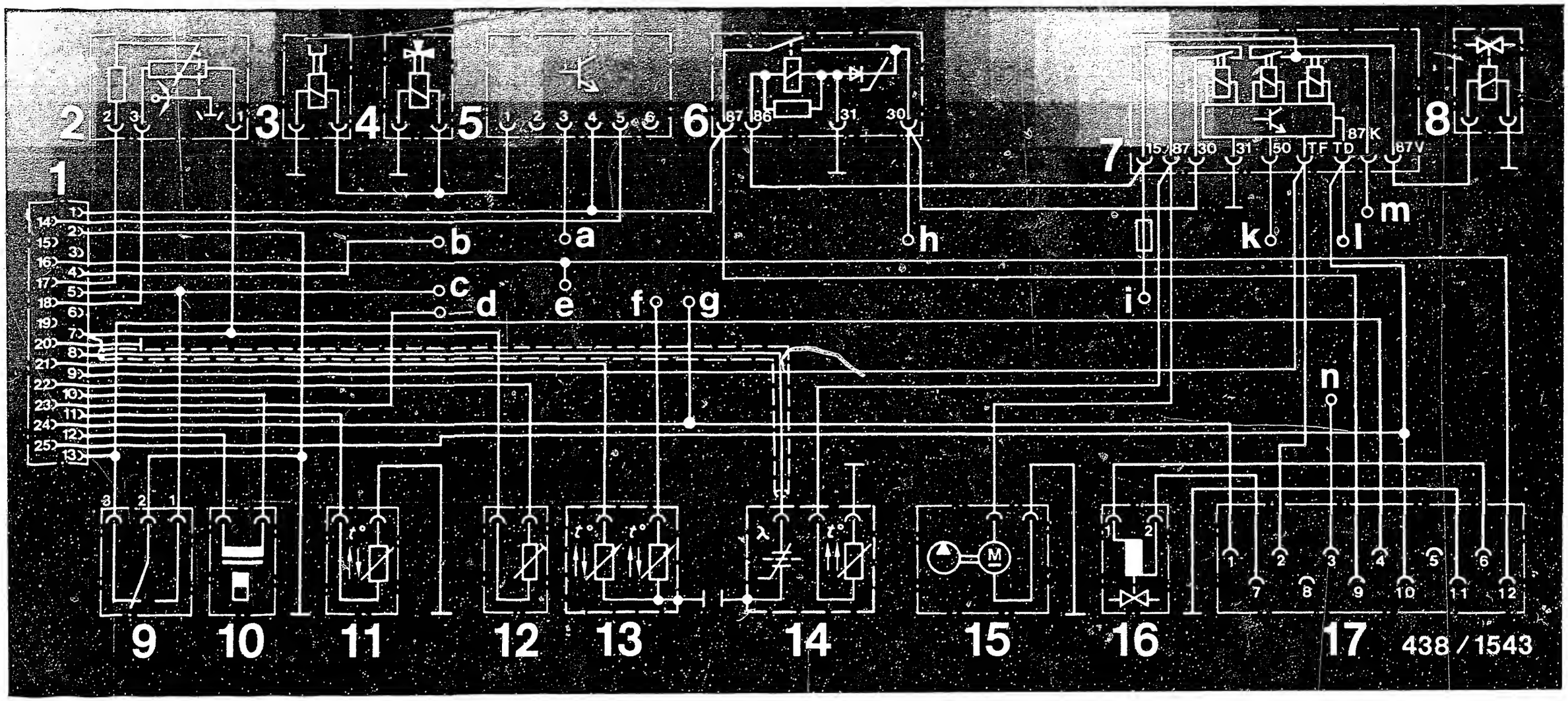
FD = Date of manufacture



1 = Control unit, KE-Jetronic
2 = Air-flow sensor potentiometer
3 = Electro-magnetic coupling, air pump (only CAT)
4 = Change-over valve, air pump (only CAT)
5 = Relay, air injection (only CAT)
6 = Over-voltage protection relay
7 = Electronic relay
8 = Cold-start valve
9 = Throttle-valve switch, idle/full load
10 = Electro-hydraulic pressure actuator
11 = Temperature sensor (intake air)
12 = Trimming plug, mixture map
13 = Temperature sensor, coolant (Double NTC)
14 = Heated lambda sensor
15 = Electric fuel pump
(2 pumps are installed, connected in parallel)
16 = Idle actuator (non-Bosch product)
17 = Control unit, low-idle-speed control
(non-Bosch product)

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT

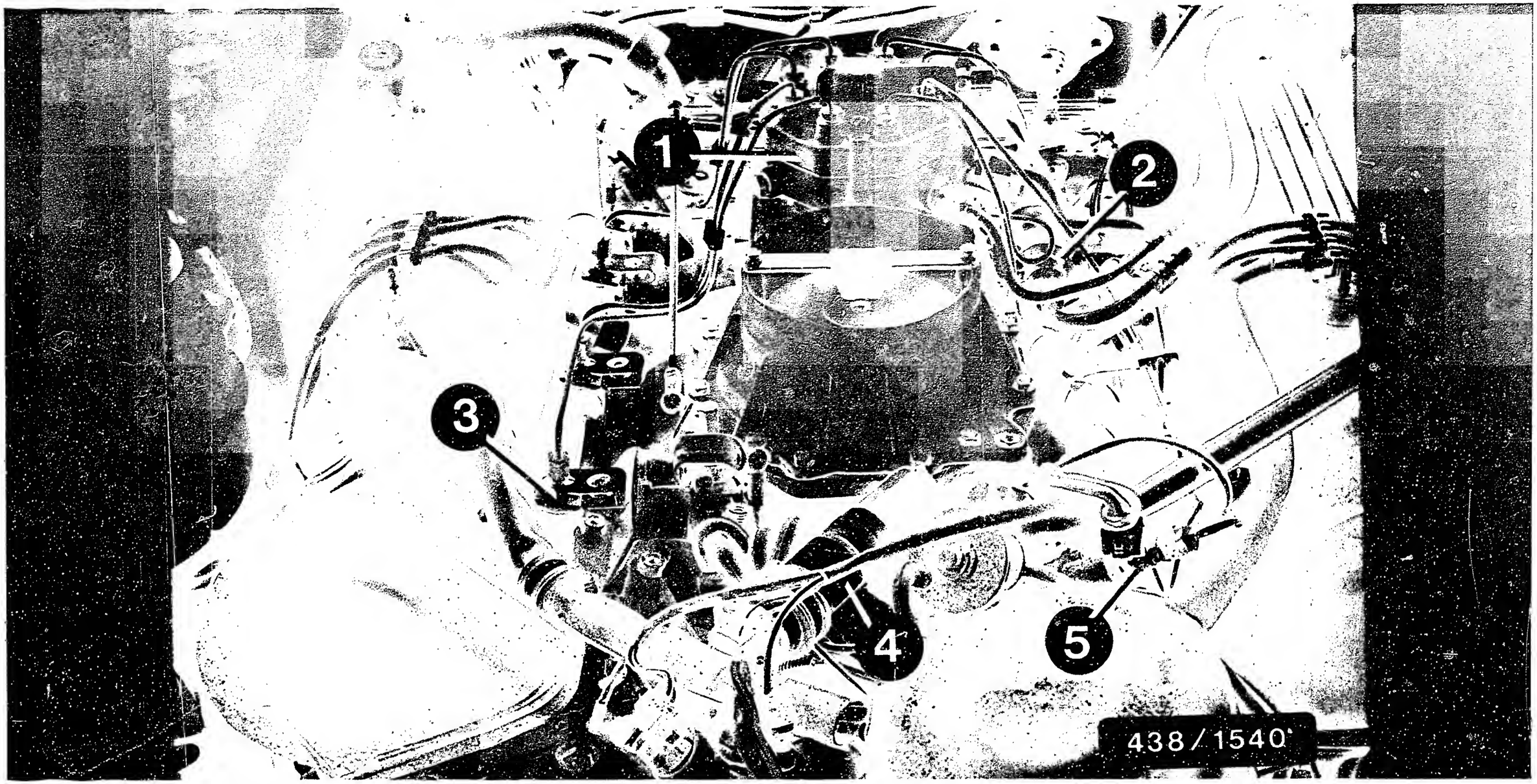
D19 ⟹
D20 ⟺



a = Terminal 15
b = Plug connection, trip computer
c = Trigger box, ignition system
d = Lambda test output (diagnosis socket outlet, socket 3)
e = Plug connection, start-locking switch, socket 3
f = Trigger box, ignition system
g = Speed signal

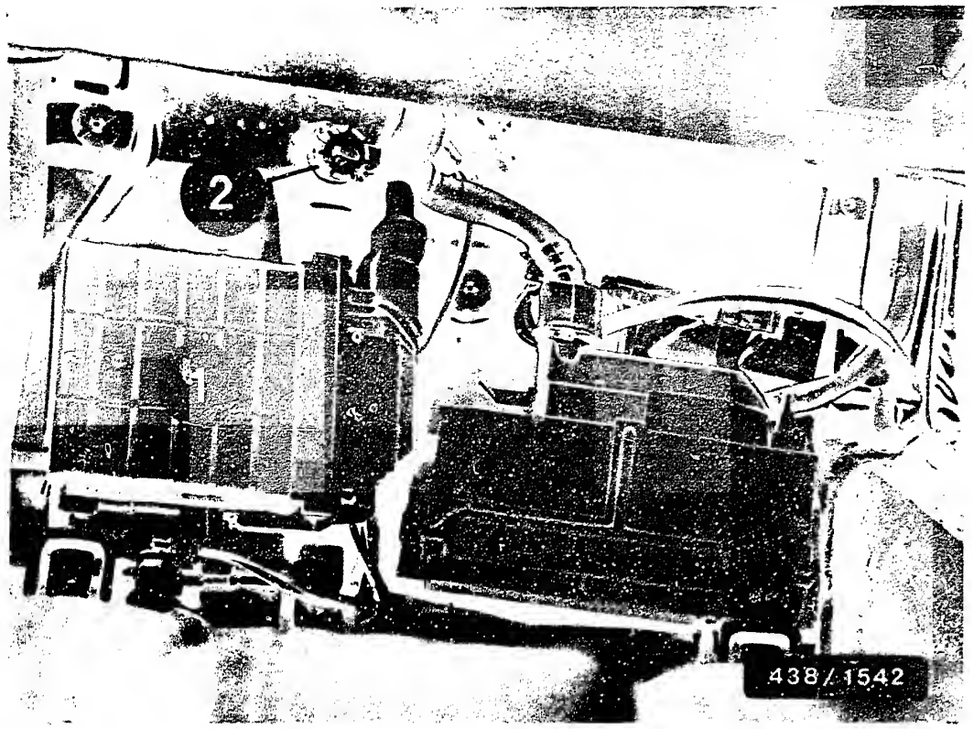
h = Terminal 30
i = Terminal 15 (fuse 7)
k = Plug connection, start-locking switch, socket 4
l = Terminal TD, ignition
m = Kick-down switch, socket 1
n = Control unit, compressor cutoff

Electrical terminal diagram with electric fuel pump safety circuit (continued)



1 = Mixture–control unit
2 = Pressure regulator
3 = Injection valve
4 = Idle actuator (non–Bosch product)
5 = Cold–start valve

INSTALLATION POSITION OF COMPONENTS



1 = KE-Jetronic control unit (Type 107)
2 = Mixture-map trimming plug

In the Type 107, the KE-Jetronic control unit and mixture-map trimming plug are positioned in the footwell on the right beneath the floor panel;
in the Type 126, in the footwell on the right behind the side panel.

Installation position of further components

Relay, electric fuel pump:
In the Type 126, in the eng. comp, on left
in the Type 107, behind the glove comp.

Relay, over-voltage protection:
In the Type 126, in the eng. comp. on left
in the Type 107, in the footwell on right
behind the side panel.

Temperature sensor, engine (NTC II):
At the left (referring to forward direction of travel) at cyl. head at rear.

T A B L E O F C O N T E N T S

Trouble-shooting instructions : MB-5015

BOSCH system : KE 3.1-Jetronic

Make of vehicle : Mercedes-Benz

Basic microcard : PKW-014

Test instructions	Coordinates
Special features	E02
Self-diagnosis / Rapid diagnosis chart	E07-E18
Test specifications	E03-E06
Electrical terminal diagram	E19-E22
Electrical wiring diagram	
Hydraulic-lines diagram	
Diagram of air / fuel lines	
Tools and test equipment	
Testing and adjustment instructions	
Installation position of components	E23-E26
Notes on removal and installation	
General important information	

Tests without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* These instructions contain the KE 3.1-Jetronic trouble-shooting instructions, valid at the time of publication, for the following Mercedes-Benz model:
  500 SE/SEL/SEC, 5,0l/8 Zyl. 09.85->

* Trouble-shooting with these instructions may only then take place when the details of the "Summary - Service Information for Vehicles" (KFZ-000) coincide with those of the vehicle type and with the BOSCH number of the KE-Jetronic control unit installed.

* Control unit using digital techniques, characteristic-map control using microprocessor.

* Multi-functional fuel-management system with a characteristic map for operation with lambda closed-loop control (CAT) and a characteristic map for operation without lambda closed-loop control (ECE).
  Activation of the characteristic maps by trimming plug with corresponding marking.
  To set to the fuel grades unleaded regular and unleaded premium, only the ignition trimming plug must be re-connected.

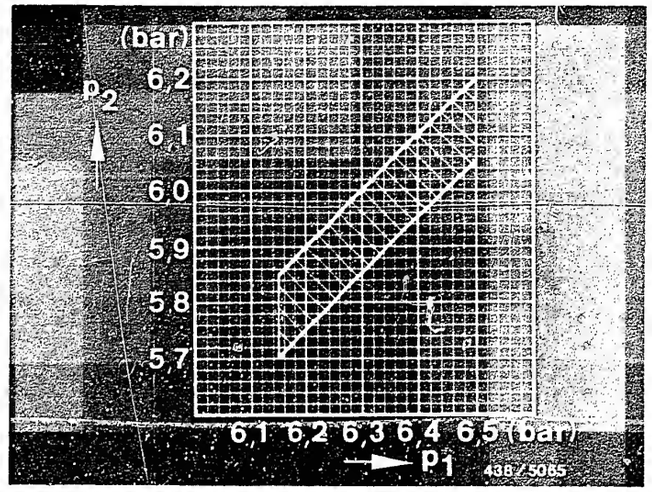
* Electronically controlled idle-speed control with single-winding rotary actuator, without bypass adjusting screw.

* Activated-carbon filter and regeneration valve for return of gasoline vapors into the intake manifold. (Fuel evaporation system)

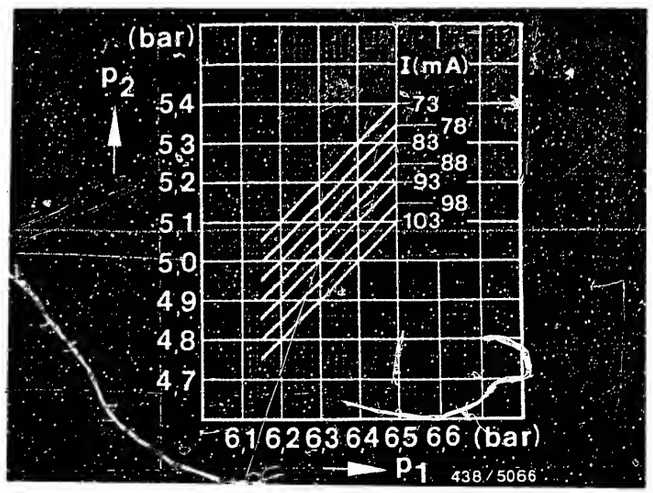
* Secondary air injection (only in CAT version)

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification	
1	Electric fuel pump – fuel delivery:	At least 1800 cm ^{3} /min	
2	Primary pressure:	6,15...6,5 bar	
3	Differential pressure: Suppression of peak coil current: Actuate starting motor with fuel-pump relay disconnected. Do not switch off ignition after starting. Take lower-chamber pressure set value "warm" from top chart corresponding to primary pressure measured. (Actuator current 0 mA) Take lower-chamber pressure set value "cold" from bottom chart corresponding to primary pressure measured and actuator current. Tolerance ± 0.15 bar. Simulation of "cold" state: press push-button 3 at test adapter.		
4	Leakage test, complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 3,3 bar 3,2 bar	
5	Injection valves, opening pressure:	3,7...4,8 bar	
6	Fuel deliveries, comparative measurement: (Actuator current 0 mA)	Setting point: (cm ^{3} /min)	Max. permis. delivery: (cm ^{3} /min)
	Idle: Part load: Full load:	6,0 40,0 100,0	6,8 42,5 109,0
	Min. delivery at max. air-flow sensor plate defl.:	140 cm ^{3} /min	



p 1 = Primary pressure
p 2 = Lower-chamber pressure



TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
7	Rate of flow, KE restriction:	130...150 cm^3 /min
8	Temperature sensor, air (NTC I): Air temperature +15...+30°C:	 1,3...3,6 k Ω
9	Temperature sensor, engine (NTC II): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	 1,3...3,6 k Ω 250...390 Ω
10	Idle-mixture-adjusting screw basic setting: Fuel-distributor seat - needle bearing:	 22,6...22,8 mm
11	Idle adjustment: Low-idle-speed control (non-Bosch product). For testing, engine at norm. op. temperature. Idle speed: Idle-actuator current at idle speed: Engage driving position, speed: <u>Only ECE</u>: CO concentration in exhaust gas: <u>Only CAT</u>: Check lambda closed-loop control: Measurement with lambda closed-loop control tester (e.g. KDJE-P 600) and adapter lead (e.g. KDJE-P 600/52) at diagnosis socket outlet (pin 3). Alternatively: Current measurement using universal test adapter. Put fuel evaporation system out of operation. Determine on/off ratio (mean value) at n = 2500 min^{-1} . Deviation of on/off ratio (mean value) at idle compared to n = 2500 min^{-1} : Adjustment at idle-mixture-adjusting screw. After adjustment, repeat measurement.	 600...700 min^{-1} 700...1000 mA 450...550 min^{-1} 1...2 % CO by vol. +5...+15 %

SELF-DIAGNOSIS

All Daimler-Benz 8-cylinder engines have been equipped as of FD 552 with self-diagnosis using on-off ratio measurement.

Defective input signals of the KE-Jetronic control unit may be indicated at the lambda test output (diagnosis socket outlet, socket 3) using the lambda closed-loop control tester.

Short circuiting and breaks in lines are detected. Sporadically occurring faults (e.g. loose contact) are not detected. Output of the fault signals takes priority over output of the lambda closed-loop control signal.

The faults which can be indicated are not discussed in detail here, since the input signals of the KE-Jetronic control unit may be tested using the universal test adapter (rapid diagnosis chart).

However, should a constant on-off ratio be indicated when testing the lambda closed-loop control using on-off ratio measurement, the input signals of the KE-Jetronic control unit must be checked (rapid diagnosis chart).

RAPID DIAGNOSIS CHART TO UNIVERSAL TEST ADAPTER ETT 018.01 WITH KE3 ADAPTER LEAD 1 684 463 169 AND APPROPRIATE MULTITESTER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electric/electronic peripheral and control-unit functions of the KE-Jetronic, including the lambda closed-loop control.

Important note on the rapid diagnosis chart:

The "Test conditions" column gives information as to in which test steps the control-unit plug must be connected/ disconnected. Make absolutely certain that there is no current at the system when connecting or disconnecting, i.e. the ignition must be switched off and the electric safety circuit must not be short circuited.

The "Test connections" column provides information about the leads connected to the respective measuring path, referring to the assignment in the control-unit plug. Possibly necessary trouble-shooting is with regard to these leads.

The "Test specifications" column contains the test specifications for both the version without lambda closed-loop control (ECE, left-hand test-specifications column) and for the version with lambda closed-loop control (CAT, right-hand test-specifications column). Before starting testing, determine which version is being tested. If only one test specification is given, this applies to both versions.

Attention: When carrying out the test, make sure that the trimming plug is in position 1.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
1	| V	4	–	Int. resistance(R_1) pressure actuator	12–10	Disconnect control-unit lead plug.	20...30 Ω
2	| V	5	–	Resistor NTC II (engine)	21– 2	Engine temperature +15°...+30° C: approx. +80° C :	1,3...3,6 k Ω 250...390 Ω
3	| V	6	–	Resistor NTC I (intake air)	11– 2	Air temperature in area of NTC I: +15°...+30° C:	1,3...3,6 k Ω
4				Signal, altitude sensor		Connect control unit. Switch on ignition. Voltmeter connection to blue Ω sockets. Signal altitude-dependent: 0 meters (sea level): 500 meters: 1000 meters: 1500 meters: 2000 meters: 3000 meters:	Test step not applicable!
5	| V	9	–	Throttle-valve switch, idle	13– 2	Switch off ignition. Disconnect control-unit lead plug. Throttle valve closed: open:	 0...10 Ω > 1000 Ω
6	| V	10	–	Throttle-valve switch, full load	5– 2	Throttle valve closed: fully open:	infinite Ω > 5000 Ω
7	| V	11	–	Microswitch idle linkage	24– 2	Throttle valve closed: open:	0...10 Ω infinite Ω
8	| V	12	–	Ground, control unit	20– 2		——— Ω
9	| V	13	–	Ground, pin 7	7– 2	Switch off ignition. Connect control unit.	0...10 Ω

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications ECE	CAT
10	⎍ V	14	–	Trimming plug mixture map	22– 2	Disconnect control-unit lead plug. Disconnect lead plug from air-flow sensor potentiometer and connect socket 1 of plug (in upper installation position) to engine ground. Trimming-plug position 1: 2: 3: 4: 5: 6: 7:	 50... 60 Ω 100... 120 Ω 150... 190 Ω 230... 270 Ω 330... 370 Ω 430... 470 Ω 570... 620 Ω	 900... 1020 Ω 1200... 1350 Ω 1500... 1750 Ω 2000... 2400 Ω 3000... 3600 Ω 5000... 5600 Ω 11000...12000 Ω
11	⎍ V	15	–	Transmission switch (only automatic transmission)	16– 2	Connect air-flow sensor potentiometer. Selection lever posn. P, N: Driving position selected:	 0...10 Ω infinite Ω	
12	5	–	–	TD signal	25– 2	Start eng. (starting motor):	Voltage undefined	
13	6	–	–	Control-unit supply	1– 2	Switch on ignition:	8...15 V	
14	7	–	–	Idle actuator supply and continuity	3– 2	Switch on ignition:	— V	
15	8	–	–	Tempomat signal	6– 2	Switch Tempomat operation:	— V	
16	9	–	–	Air-conditioner cut-in signal	19– 2	Switch off ignition. Connect control unit. Start engine, switch on air conditioner. Temperature regulator = minimum temperature:	 — V	
17	10	–	–	Supply, air-flow sensor potentiometer	18– 2	Switch on ignition:	4,35...5,35 V	

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specificatons ECE	CAT
18	11	–	–	Signal, air–flow sensor potentiometer	17– 2	Switch on ignition. Air–flow sensor plate in neutral position: Deflect air–flow sensor plate by hand, continuous voltage rise up to max.:	0 V 5,35 V	
19	13	–	1	Temperature signal from control unit	9– 2	Switch on ignition. While actuating btn 1:	1,5...1,9 V	
20	14	–	–	Consumption signal	4– 2	Start engine – idle: With regulation:	Voltage indefined Voltage change	
21	–	–	–	Peak coil current	12–12	Switch on ignition:	->FD —— : ——— mA FD 546–>: 60...80 mA	->FD —— : ——— mA FD 546–>: 65...85 mA
22	–	–	1	Warm–up enrichment +20°C	12–12	Warm up engine – idle. Current value with btn 1 pressed:	->FD —— : ——— mA FD 546–>: 7...11 mA	->FD 551 : 8...12 mA FD 552–>: 3... 5 mA
23	–	24	2	Actuator current Engine at norm. op. temp.	12–12	Eng. at norm. op. temp., idle Current valve with btn 2 pressed: With CAT, oscillating, mean value:	->FD —— : ——— mA FD 546–>: 2... 4 mA	->FD —— : ——— mA FD 546–>: –1...+1 mA
24	–	21	1	Starting enrichment	12–12	So that eng. fails to start: Disconnect speed relay for elec. fuel pump. Short circuit ign. coil term.4 to grnd via resist. of at least 2k Ω (E.g. with sleeve–type suppressor and spark gap) While btn 1 pressed, actuate starting motor. Current rise (max. 1 s.) to:	->FD —— : ——— mA FD 546–>: 100...130 mA	->FD —— : ——— mA FD 546–>: 120...150 mA

FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

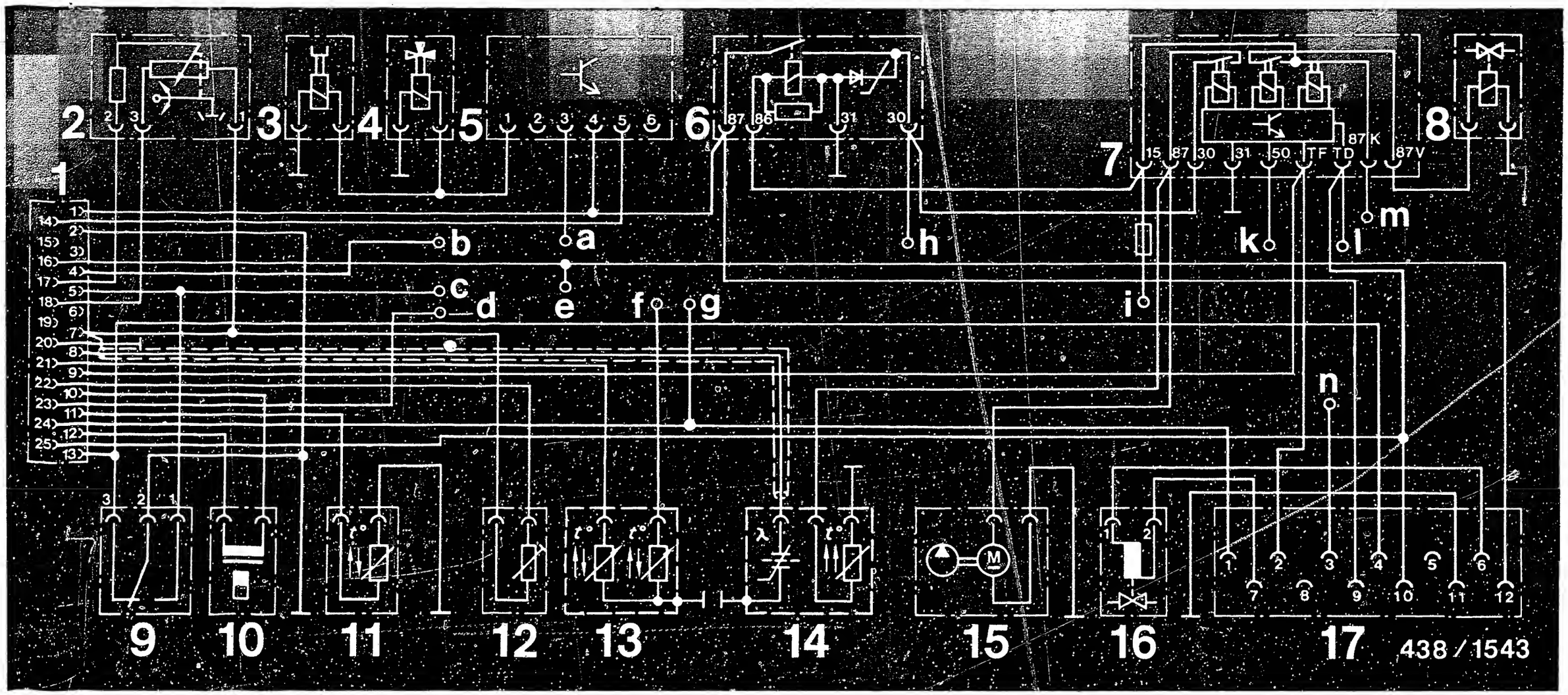
No.	Switch/Btn V	Switch/Btn Ω	Switch/Btn Btn	Under test	Test pins	Test conditions	Test specifications ECE		Test specifications CAT	
25	–	21	1	Post-start enrichment	12-12	Start engine (at normal op. temp.) while actuating btn 1. Current value:	->FD —— :	—— mA	->FD 551 :	40...50 mA
							FD 546->:	15...25 mA	FD 552->:	30...40 mA
						Current value const. for app.	->FD —— :	—— s	->FD 551 :	3... 9 s
							FD 546->:	4...10 s	FD 552->:	9...17 s
						Then slow speed reg. to:	->FD —— :	—— mA	->FD 551 :	8...12 mA
							FD 546->:	7...11 mA	FD 552->:	3... 5 mA
26	–	21	1	Acceleration enrichment	12-12	Eng. at norm. op. temp., idle While actuating btn 1, perform snap acceleration of eng Thus current rise (approx. 1 s) to:	->FD —— :	—— mA	->FD —— :	—— mA
							FD 546->:	60...80 mA	FD 546->:	50...70 mA
						Note: Level of current value dependent upon intensity of acceleration (travel/ duration of air-flow sensor plate movement).				
27	–	–	–	Overrun cut-off	12-12	Re-connect ohmmeter (swap positive and negative). Start eng. (norm. op. temp.). Speed n to approx.:	->FD —— :	—— min $^{-1}$	->FD —— :	—— min $^{-1}$
						Hold there.	FD 546->:	1800 min $^{-1}$	FD 546->:	1700 min $^{-1}$
						Manually actuate idle throttle-valve switch (for 4- and 6- cyl. eng. micro-switch at accelerator linkage). Engine hunts. Current reading during falling speed phase:		-40...-80 mA		-40...-80 mA

FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications ECE	CAT
28	–	24	–	Full-load enrichment	12-12	Eng. at norm. op. temp., idle Current value (ECE): With CAT, oscil., mean value: Briefly push accelerator pedal to floor (full-load throttle-valve switch must switch). During speed rise, current value rises by: <u>Attention</u>: Do this very briefly, so that speed does not rise too much and engine is not damaged.	->FD —— : ——— mA FD 546->: 2... 4 mA ->FD —— : ——— mA FD 546->: 3... 6 mA	->FD —— : ——— mA FD 546->: -1...+1 mA ->FD —— : ——— mA FD 546->: 3... 6 mA
29	–	21	–	Lambda closed-loop control, open-loop control mode	12-12	Disconnect regeneration lead to throttle-valve assembly at regeneration valve and seal. Eng. at norm. op. temp., idle Current value:	——	-1...+1 mA
30	–	24	–	Lambda closed-loop control, closed-loop control mode	12-12	Eng. at norm. op. temp., idle Closed-loop control mode can be recognized from the oscillating current reading. Mean value: If mean value outside tolerance, set (idle-mixture-adjusting screw) to:	—— ——	-1...+1 mA approx. 0 mA
31	–	22	–	Lambda closed-loop control, rich stop	12-12	Eng. at norm. op. temp., idle Current rise to:	——	10...14 mA
32	–	23	–	Lambda closed-loop control, lean stop	12-12	Eng. at norm. op. temp., idle Current drop to:	——	-10...-14 mA

FD = Date of manufacture

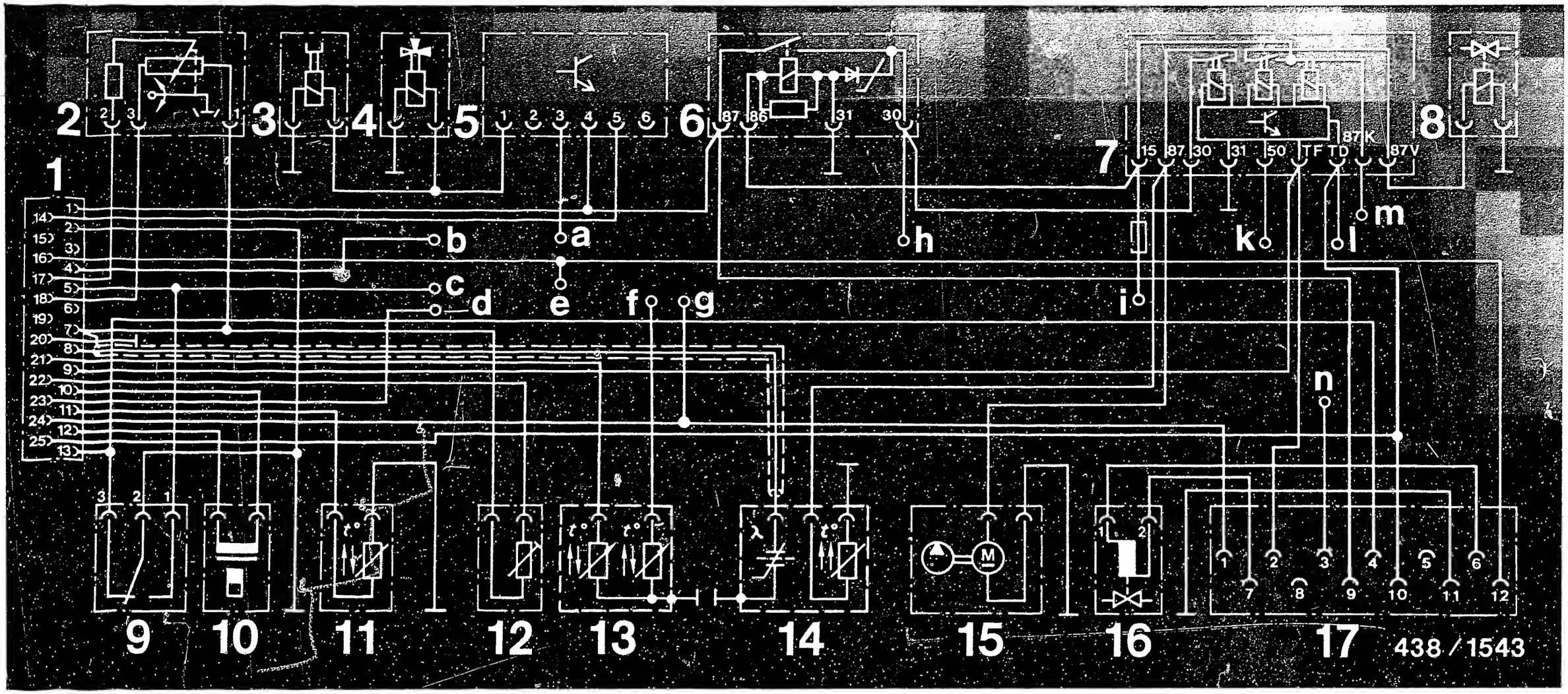


1 = Control unit, KE-Jetronic
2 = Air-flow sensor potentiometer
3 = Electro-magnetic coupling, air pump (only CAT)
4 = Change-over valve, air pump (only CAT)
5 = Relay, air injection (only CAT)
6 = Over-voltage protection relay
7 = Electronic relay
8 = Cold-start valve
9 = Throttle-valve switch, idle/full load
10 = Electro-hydraulic pressure actuator
11 = Temperature sensor (intake air)
12 = Trimming plug, mixture map
13 = Temperature sensor, coolant (Double NTC)
14 = Heated lambda sensor
15 = Electric fuel pump
(2 pumps are installed, connected in parallel)
16 = Idle actuator (non-Bosch product)
17 = Control unit, low-idle-speed control
(non-Bosch product)

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT

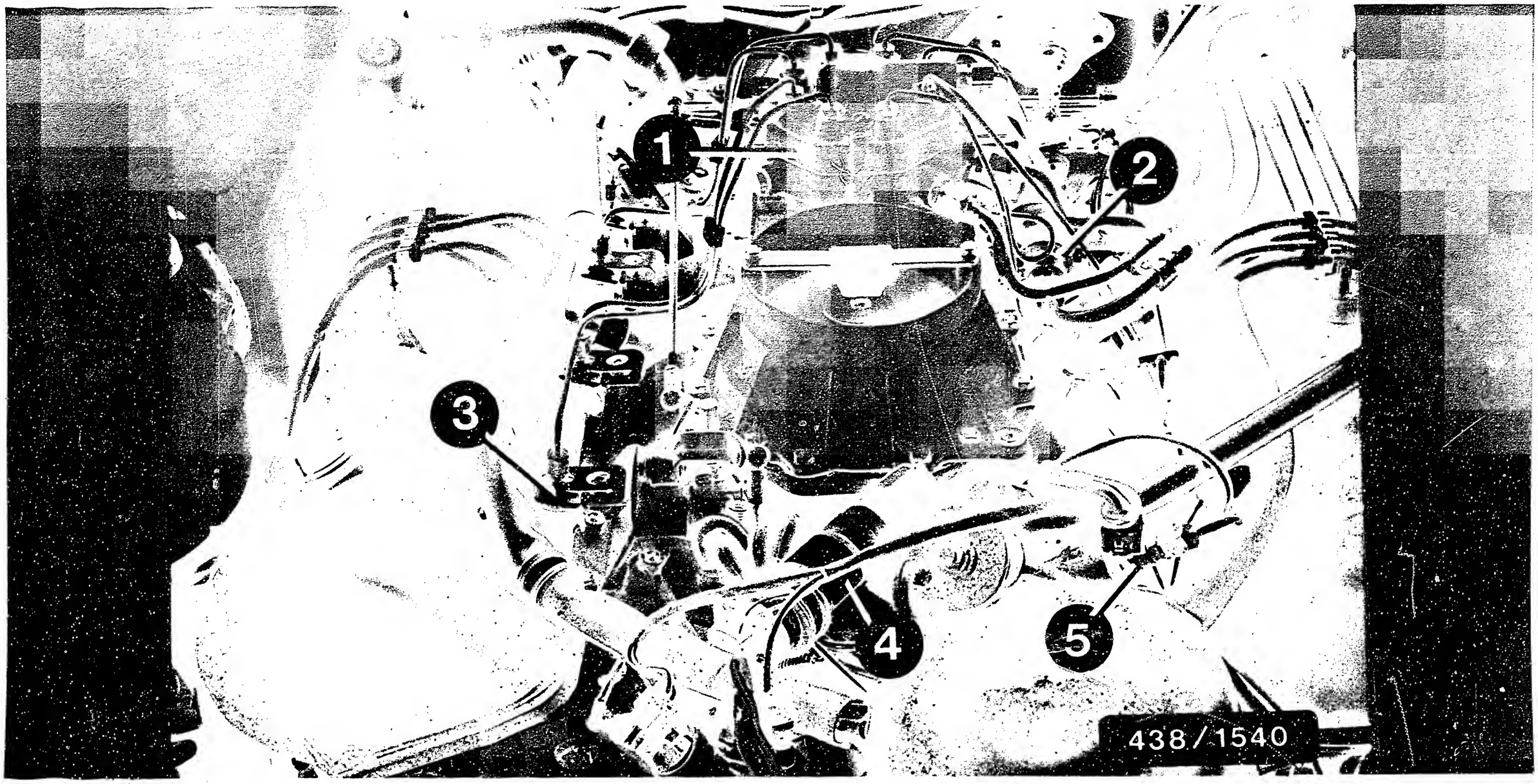
E19 —⟹

E20 —⟸⟹



a = Terminal 15
b = Plug connection, trip computer
c = Trigger box, ignition system
d = Lambda test output (diagnosis socket outlet, socket 3)
e = Plug connection, start-locking switch, socket 3
f = Trigger box, ignition system
g = Speed signal
h = Terminal 30
i = Terminal 15 (fuse 7)
k = Plug connection, start-locking switch, socket 4
l = Terminal TD, ignition
m = Kick-down switch, socket 1
n = Control unit, compressor cutoff

Electrical terminal diagram with electric fuel pump safety circuit (continued)



1 = Mixture–control unit
2 = Pressure regulator
3 = Injection valve
4 = Idle actuator (non–Bosch product)
5 = Cold–start valve

INSTALLATION POSITION OF COMPONENTS

1 = KE-Jetronic control unit (Type 107)
2 = Mixture-map trimming plug

In the Type 107, the KE-Jetronic control unit and mixture-map trimming plug are positioned in the footwell on the right beneath the floor panel;
in the Type 126, in the footwell on the right behind the side panel.

Installation position of further components

Relay, electric fuel pump:
In the Type 126, in the eng. comp, on left
in the Type 107, behind the glove comp.

Relay, over-voltage protection:
In the Type 126, in the eng. comp. on left
in the Type 107, in the footwell on right behind the side panel.

Temperature sensor, engine (NTC II):
At the left (referring to forward direction of travel) at cyl. head at rear.

T A B L E O F C O N T E N T S

Trouble-shooting instructions : POR-5002

BOSCH system : Motronic

Make of vehicle : PORSCHE

Basic microcard : POR-507

Test instructions	Coordinates
Special features	A02-A04
Self-diagnosis / Rapid diagnosis chart	A04-A20
Test specifications	A21-A22
Electrical terminal diagram	A25-A26
Electrical wiring diagram	
Hydraulic-lines diagram	
Diagram of air / fuel lines	
Tools and test equipment	
Testing and adjustment instructions	
Installation position of components	A23-A24
Notes on removal and installation	
General important information	A27-A28

Tests without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

This microcard contains the testing and repair instructions for the Motronic, valid at the time of publication, for the following models:

* PORSCHE 911 CARRERA with 3.2 l/6-cyl. engine, high compression (10.3: 1). Valid as of 6.85 for the rest of the world, Sweden, Switzerland, Australia and West Germany 86 with catalytic converter and for vehicles prepared for catalytic converter. Relevant control units: 0 261 200 078 as of 6.85 and 0 261 200 084 as of 9.86.
  Modification to Stage A is not possible.

* PORSCHE 911 CARRERA with 3.2 l/6-cyl. engine, low compression (9.5: 1). Valid as of 6.86 for USA, Canada, Japan and West Germany 86 with catalytic converter. Relevant control units: 0 261 200 082 as of 6.86 and 0 261 200 085 as of 9.85.

There is one control unit for each of the Sports versions of the high-compression and low-compression engines: Control unit 0 261 200 084 and 0 261 200 085. These control units differ from the normal version 0 261 200 078 and 0 261 200 082 only with respect to the engine-speed limitation being raised to 6900 min^{-1}. The control units must not be mixed up.

Vehicles with catalytic converter are equipped as standard with a closed tank-ventilation system with activated-carbon canister. All models are equipped with idle-charge closed-loop control.

Variant coding in Motronic wiring harness

In order to be able to use one common control unit for all variants for different countries and vehicles with and without catalytic converter,

terminal 10 and terminal 28 are connected in different ways in the wiring harness. In this way, the ignition map and injection map are influenced.

Term. 10 of the control unit can be connected to the vehicle ground via a plug connection which is positioned in the vicinity of the control unit.

The altitude sensor is always connected to term. 28. An adapter cable is connected between altitude sensor and control unit term. 28 as required (see table).

PORSCHE part number for adapter cable with 2 resistors (750i und 1800i):

911.612.421.00

Control unit 0 261 200 078 and ...084	Plug connection of term. 10	A=Alt. sensor connected to term. 28 B=Adapter cable connected to term. 28
Vehicle <u>without</u> catalytic converter	<u>Not</u> connected. Switzerland/ Sweden: connected	A and B
Vehicle <u>with</u> catalytic converter	<u>Not</u> connected. Switzerland/ Sweden: connected	A and B printed-circuit board switch in position 0 *)

*) Control unit 0 261 200 078 with the PORSCHE-No. 911.618.111.13 is supplied as standard in printed-circuit board switch position 4 for countries with low-octane fuel (e.g. Belgium, France, Great Britain, Italy, Portugal, Spain etc.). When converting to a catalytic-converter version, the printed-circuit board switch must be set to position 0 (left-hand stop), i.e. retardation of the ignition is cancelled.

Control unit 0.261 200 082 and ... 085	Plug conn. from term. 10	A=Altitude sensor conn. to term. 28 B=Adapter cable conn. to term. 28
Germany, USA(federal), Canada, <u>Austria</u>	not plugged	A
California, Japan	plugged	A
Switzerland	not plugged	A and B
Australia	plugged	A and B

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

The following rapid diagnosis chart makes it possible for the experienced Motronic specialist to rapidly test the electrical part of the system using the universal test adapter.

The rapid diagnosis chart contains the following information:

* Test-step sequence.
* Position of the V- and Ω -program switch.
* Remarks on operating the universal test adapter or other components.
* Test specifications for motortester and multimeter.

Note:
* Adapter cable 1 684 463 124 for vehicles without lambda closed-loop control.
* Adapter cable 1 684 463 128 for vehicles with lambda closed-loop control.

Adapter cable 1 684 463 124 can also be used for vehicles with lambda closed-loop control by way of replacement; however, the lambda test steps must be carried out in addition (see test steps 43a, 44a, and 45a).

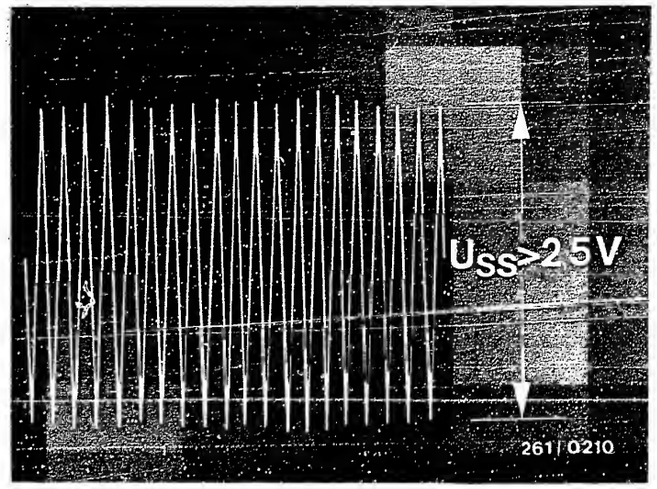
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (Continued)

Valid for the control units 0 261 200 078 (6.85->) and 0 261 200 084 (9.86->)
0 261 200 082 (6.86->) and 0 261 200 085 (9.86->)

Test step	Switch position V	Switch position Ω	Measurement	Measurement at control-unit plug between term.	Remarks	Test specifications (reading)
1	V	1	Insulation resistance of speed sensor.	8 and 5	Shift into neutral. Ignition off. Disconnect control unit and pump fuse No. 2.	greater than 1 MΩ
2	V	2	Insulation resistance of reference-mark sensor.	25 and 5	—	greater than 1 MΩ
3	V	3	Winding resistance of speed sensor.	8 and 27	—	0,6...1,6 kΩ
4	V	4	Winding resistance of reference-mark sensor.	25 and 26	—	0,6...1,6 kΩ
5	V	5	Resistance of temperature sensor II (engine)	13 and 5	Resistance temperature-dependent: (+ 15° C...+ 30° C) : (+ 80° C) :	 1,45...3,3 kΩ 280...360 Ω
6	V	6	Resistance of temperature sensor I (air)	22 and 5	Resistance temperature-dependent: (+ 15° C...+ 30° C) : (+ 80° C) :	 1,45...3,3 kΩ 280...360 Ω
7	V	7	Resistance of characteristic-map switch	10 and 5	For S/CH and stage A as well as California : For US Federation and general:	smaller 10 Ω than greater1 MΩ than
8	V	8	Not applicable	—	—	—
9	V	9	Throttle-valve switch (microswitch): Resistance of idle contact.	2 and 5	Accelerator in neutral position: Slightly open throttle valve (note travel):	smaller 10 Ω than greater1 MΩ than
10	V	10	Throttle-valve switch: Resistance of full-load contact.	3 and 5	Push accelerator to floor:	smaller than 10 Ω

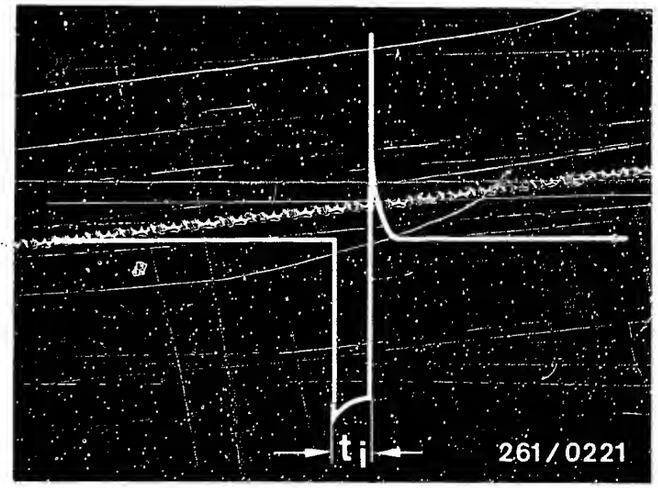
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (Continued)

Test step	Switch position V	Switch position Ω	Measurement and remarks	Control-unit plug between term.	Test specifications (Reading)
11	| V	11	Resistance of ground cable	16 and 5	Smaller than 10 Ω
12	| V	12	Resistance of ground cable	17 and 5	Smaller than 10 Ω
13	| V	13	Resistance of ground cable	19 and 5	Smaller than 10 Ω
14	| V	14	Not applicable		
15	| V	15	Resistance at input for altitude correction (see variant coding A 2). Vehicles with altitude sensor, switch open (below 1000 m): Vehicles with altitude sensor, switch closed (above 1000 m): Vehicles with altitude sensor, switch open, and with adapter cable: Vehicles with altitude sensor, switch closed, and with adapter cable:	28 and 5	Greater than 1 M Ω Smaller than 10 Ω 1040 Ω ±10% 750 Ω ±10%
16	1	15	Speed-sensor signal using oscilloscope. Shift into neutral and start.	8 and 27	See upper illustration
17	2	15	Reference-mark sensor signal using oscilloscope. Shift into neutral and start.	25 and 26	See lower illustration



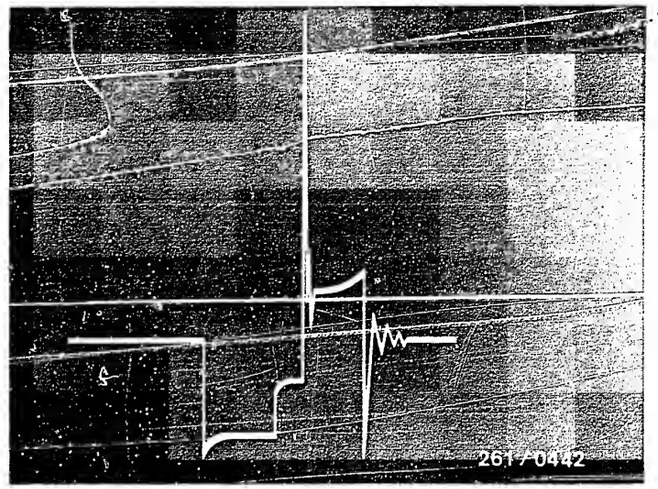
Engine-speed sensor signal

Reference-mark sensor signal



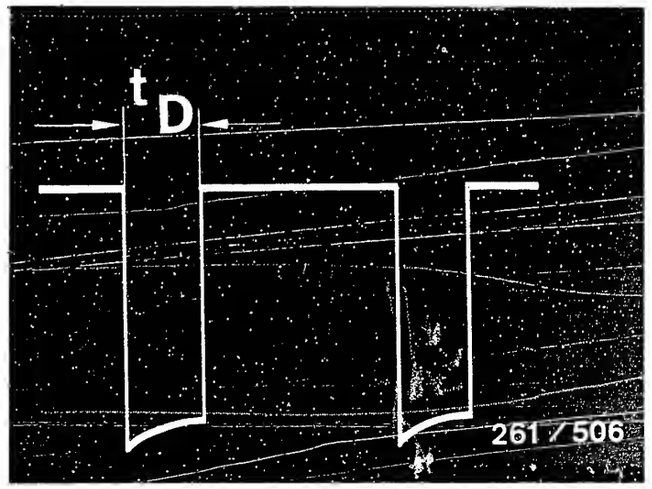
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (Continued)

Test step	Switch position V	Switch position Ω	Measurement and remarks	Measurement at control-unit plug between terms.	Test specifications (reading)
18	3	15	Not applicable	10 and 5	——
19	4	15	Voltage of air-conditioning system (if present). Switch on air conditioner.	29 and 5	greater than 8 V
20	6	15	Voltage of main relay. Ignition on.	35 and 5	10...15 V
21	7	15	Voltage of main relay. Ignition on.	18 and 5	10...15 V
22	5	15	Ignition signal from ignition coil using oscilloscope. Ignition off. Connect control unit. Disengage gear and start.	1 and 5	Signal present (see upper illustration)
23	8	15	Supply voltage for air-flow sensor. Ignition on.	9 and 5	greater than 4,5 V
24	9	15	Wiper voltage of potentiometer in air-flow sensor. Ignition on.	7 and 5	Sensor flap at rest: 200...300 mV Sensor flap fully opened: greater than 4,2 V
25			Not applicable		
26	11	15	Not applicable		
27	12	15	Starting signal from term. 50. Disengage gear and start.	4 and 5	8...15 V
28	13	15	Dwell-period signal, using oscilloscope. Disengage gear and start.	21 and 5	See lower illustration.



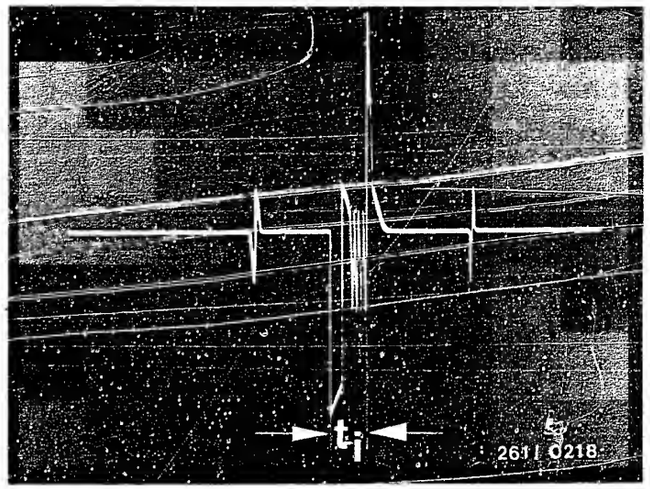
Ignition signal

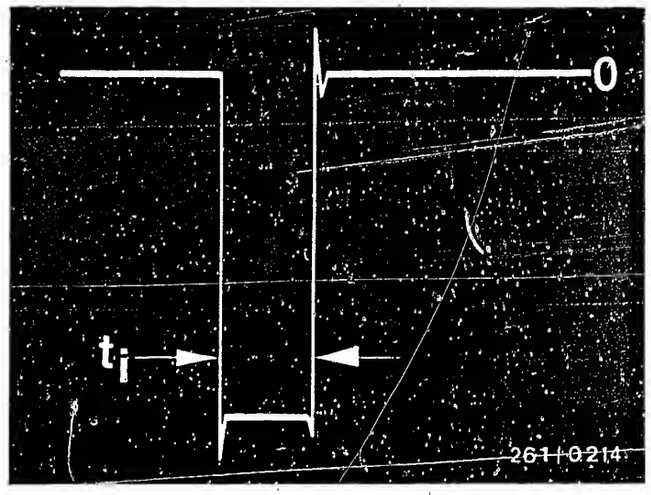
t_D = Dwell period

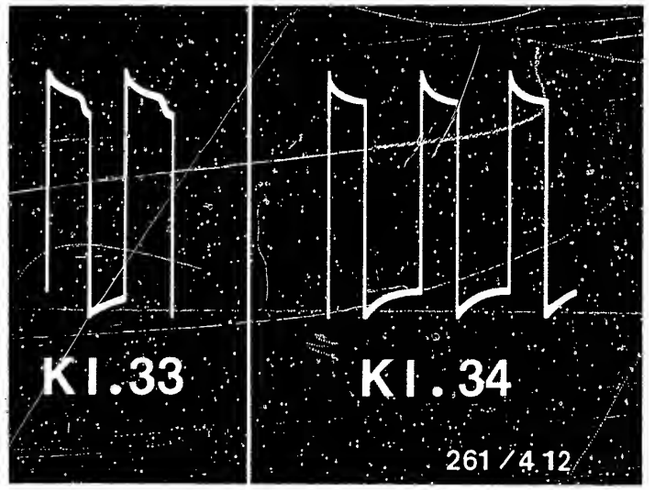


RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (Continued)

Test step	Switch position V	Switch position Ω	Btn	Measurement and remarks	Measurement at control-unit plug between term.	Test specifi-cations (reading)
29	14	15	–	Injection signal from control unit with oscilloscope. Shift into neutral and start.	14 and 5	See upper illustration
30	14	15	T1	As 29, however after pressing button (NTC II, cold) duration of injection is slightly longer. Press button only approx. 2 seconds.	14 and 5	See upper illustration; t_i is slightly wider
31	15	15	–	As test step 29, however 2nd output for injection valves	15 and 5	See upper illustration
32	16	15	–	Injection signal from control unit with oscilloscope. Shift into neutral and start.	11 and 5	See center illustration
33	17	15	–	Voltage at pump relay. Position pump fuse. Ignition on.	20 and 5	10...15 V
34	17	15	–	Voltage at pump relay. Pump control in control unit is under test. Shift into neutral and start.	20 and 5	max. 4 V
35	17	15	T3	Fuel-pressure test: Ignition off. Connect pressure gauge at test connection. Ignition on. Press button T3.	20 to ground	2,3...2,7bar
36	18	15	–	Signal at idle actuator. Ignition on.	33 and 5	See lower illustration
37	19	15	–	Signal at idle actuator. Ignition on.	34 and 5	See lower illustration

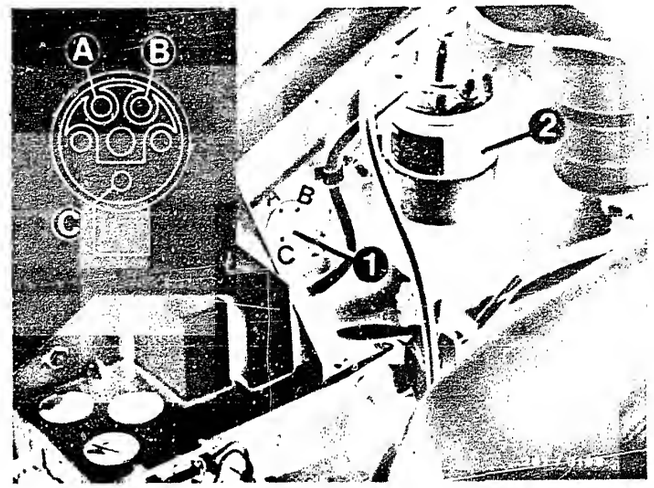






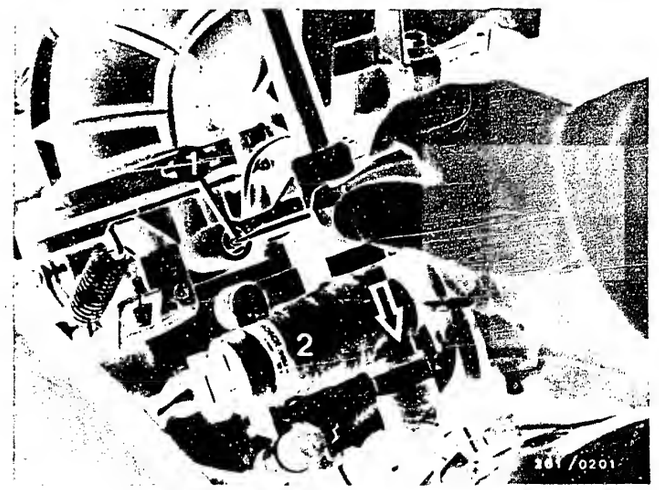
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)

Test step	Switch position V	Switch position Ω	Btn	Measurement and remarks	Measurement at control-unit plug between term.	Test specifications (reading)
38	19	15	–	Check CO and idle speed: Connect motortester and diagnosis cable (1 684 463 095 or ..158). For vehicles with lambda closed-loop control, connect CO tester to test connection in front of catalytic converter. When testing with adapter lead 1 684 463 124, disconnect plug connection of lambda sensor. Firstly measure CO concentration. Engine temperature approx. 90° C, intake-air temperature approx. +15...+30° C, consuming devices switched off. Make adjustments quickly.	———	Without lambda closed-loop control: 1...1,5 % CO by vol. With lambda closed-loop control: 0,6...1,0 % CO by vol.
			T5 and T6	For testing and adjusting the idle speed, connect term. B and term. C at the test socket using lead or press buttons T5 and T6 simultaneously and read off test specification. Remove lead at test cap and release buttons, briefly accelerate and check idle speed.		780...820 min $^{-1}$



1 = Test socket
2 = Ignition coil

1 = Adjusting screw for idle speed
2 = Idle actuator



RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)

Test step	Switch position V	Switch position Ω	Btn	Measurement and remarks	Measurement at control-unit plug between term.	Test specifications (reading)
39	19	15	–	Check spark advance at idle speed: Run engine at normal operating temperature at idle speed (780...820 min $^{-1}$). Set speed precisely, otherwise incorrect spark advance is indicated.	—	–8°...+2°
40	19	15	T6	Check spark advance at full load: Engine at normal operating temperature. Set speed to 3100 min ^{1} . Press button T6	3 to ground	High-compression engine with catalytic converter: 20°...30° Without catalytic converter: 17°...27° Low-compression engine: 19°...29°
41	19	15	–	Dwell angle at idle speed	—	10°...16°
				Dwell angle at 2000 min $^{-1}$	—	18°...29°
42	19	15	T5	Check overrun cut-off: Keep speed of 3000 min $^{-1}$ constant. Press button T5. Injection signals interrupted and speed fluctuates rhythmically.	2 to ground	Engine "hunts"

The following test steps apply only to vehicles with lambda closed-loop control. The lambda closed-loop control can be tested as follows:

1. With adapter cable 1 684 463 128, see test step 43, 44, 45.
2. Without test adapter, if only adapter cable 1 684 463 124 is available to test the Motronic, see test step 43a, 44a, 45a.

For both test methods, connect the CO-tester before the catalytic convertor and run the engine at operating temperature in idle.

Test step	Switch position V	Switch position Ω	Measurement and remarks	Control-unit term.	Test specifications (reading)
43	20	22	Testing with adapter cable 1 684 463 128: Subject of testing is upper limit of lambda closed-loop control. Test adapter connects term.24 of control unit to ground. Keep this test step brief to avoid damage to the catalytic motor.	24 to ground	CO rises above 1,5 vol.%CO
44	20	23	As test step 43, except lower limit of lambda closed-loop control. Test adapter connects + 2 V to term.24 of control unit.	24 to +2V	CO falls below 0,6 vol.%CO Uneven engine idle
45	20	24	Subject of testing is lambda sensor in closed-loop operation. Test adapter connects term.24 of control unit with lambda sensor. As above, except disconnect air hose at pressure regulator and seal off. Immediately note CO level.	24	0,6...1,0vol.%CO CO level briefly rises and then falls back to above closed-loop value.

Test step	Measurement and remarks	Test spec. (reading)
Testing of lambda closed-loop control without test adapter		
43a	The upper limit of lambda closed-loop control is tested. Separate the lambda-sensor plug connection and connect the lead to the control unit (term.24) to ground. Carry out this test step only briefly, to prevent damage to the catalytic converter.	CO rises above 1,5 vol.%
44a	The lower limit of lambda closed-loop control is tested. Connect the disconnected lead to the control unit (term.24) to approx. + 2 V (e.g. 1.5 V single-cell battery, positive to term.24, negative to vehicle ground).	CO falls below 0,6 vol.%, uneven engine running
45a	The lambda sensor is tested in closed-loop operation. Reconnect the lambda-sensor plug connection.	0,6...1,0 vol.% CO
	As above, except pull off air hose at pressure regulator and seal. Immediately observe CO value.	CO value briefly rises and falls back to above control value.



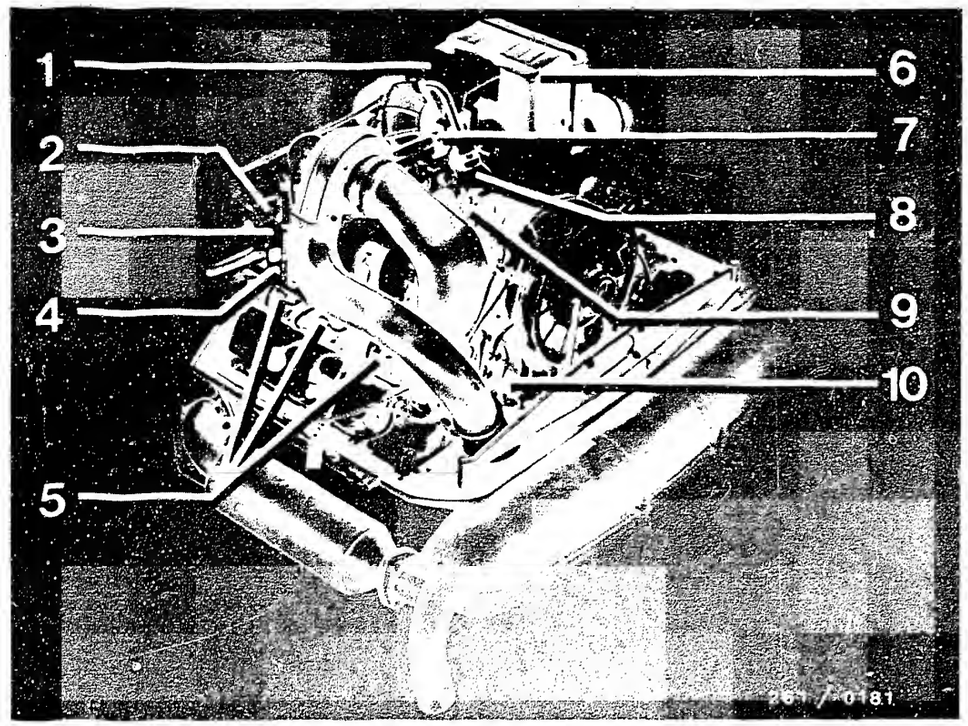
1 = Plug connection for lambda sensor
2 = Plug connection for lambda-sensor heater

Pressure regulator	
Fuel pressure	2,3...2,7 bar
Electric fuel pump	
Fuel delivery (measured in return)	at least 950 cm ^{3} /30s
Supply voltage (under load):	at least 12 V
NTC temperature sensor I (Air)	
Internal electrical resistance measured at air-flow sensor between term. 22(1) and term.6(4) at ambient temperature (+15°C...+30°C):	1,45...3,3 k Ω
NTC temperature sensor II (Engine)	
Plug color, blue. Internal electrical resistance at ambient temperature (+ 15° C...+ 30° C):	1,45...3,3 k Ω
with engine at norm. op. temp. (approx. +80°C):	280...360 Ω
Solenoid-operated injection valve	
Internal electrical resistance at ambient temperature (+ 15° C...+ 30° C):	2...3 Ω
Air-flow sensor	
Internal electrical resistance between:	
term.7(2) and term.6(4):	8...1000 Ω (*)
term.9(3) and term.6(4):	500... 800 Ω

(*) Deflect air-flow sensor flap as far as will go.

Speed sensor and reference-mark sensor	
Internal electrical resistance at ambient temperature (+15°C...+30°C):	600...1600 Ω
Throttle-valve switch	
Resistance of idle contact (Microswitch term. 2 and ground):	0 Ω
Resistance of full-load contact (term. 3 and ground):	0 Ω
Altitude sensor	
Above 1000 m altitude, contact is closed:	0 Ω
Below 1000 m altitude, contact is open:	infinite Ω
Idle actuator	
Internal electrical resistance at +15°...+30°C between	
term.4 and term.5:	17...22,5 Ω
term.4 and term.5:	19...25 Ω
Lambda-sensor heater	
Resistance value of heater winding	1...15 Ω
Idle setting	
Engine at normal op. temp.	
Ambient temperature +15°...+35°C.	
Switch off consuming devices.	
Idle speed: (bridge term. B and C at test socket)	780...820 min $^{-1}$
CO concentration:	
Vehicles without cat. converter:	1,0...1,5 % CO by vol.
USA and cat. converter vehicles:	0,6...1,0 % CO by vol.
(Measure CO in front of cat. conv., disconnect lambda-sensor plug).	

See equipment and Autodata microcard for settings for valve clearance and other engine-related data.



INSTALLATION POSITION OF COMPONENTS

1 = Air-flow sensor
2 = Pressure regulator
3 = Plug of temperature sensor, engine (NTC II)
4 = Plug of reference-mark and speed sensor
5 = Solenoid-operated injection valve
6 = Air filter
7 = Throttle-valve switch
8 = Idle actuator
9 = Diagnosis connection
10 = High-voltage distributor

INSTALLATION POSITION OF COMPONENTS (CONTINUED)
(Installation position details with reference to forward direction of travel)

* Reference-mark and speed sensor:
  In a mounting at the crankcase.

* Relay 1 (fuel-pump relay) and
  Relay 2 (main relay):
  Beneath driver's seat.

* Control unit: beneath driver's seat
* Temperature sensor I: in air-flow sensor.

* Temperature sensor II (engine)
  In cylinder head of 3rd cylinder.

* Central ground points:
  1. At intake manifold, 1st cylinder.
  2. At mounting of fuel filter.
  3. Ground strap between vehicle body and engine.

* Electric fuel pump:
  In front of the front axle cross member.

* Fuel filter: in engine compartment at left.

* Pressure damper:
  At end of fuel-distribution pipe at right, near to 6th cylinder.

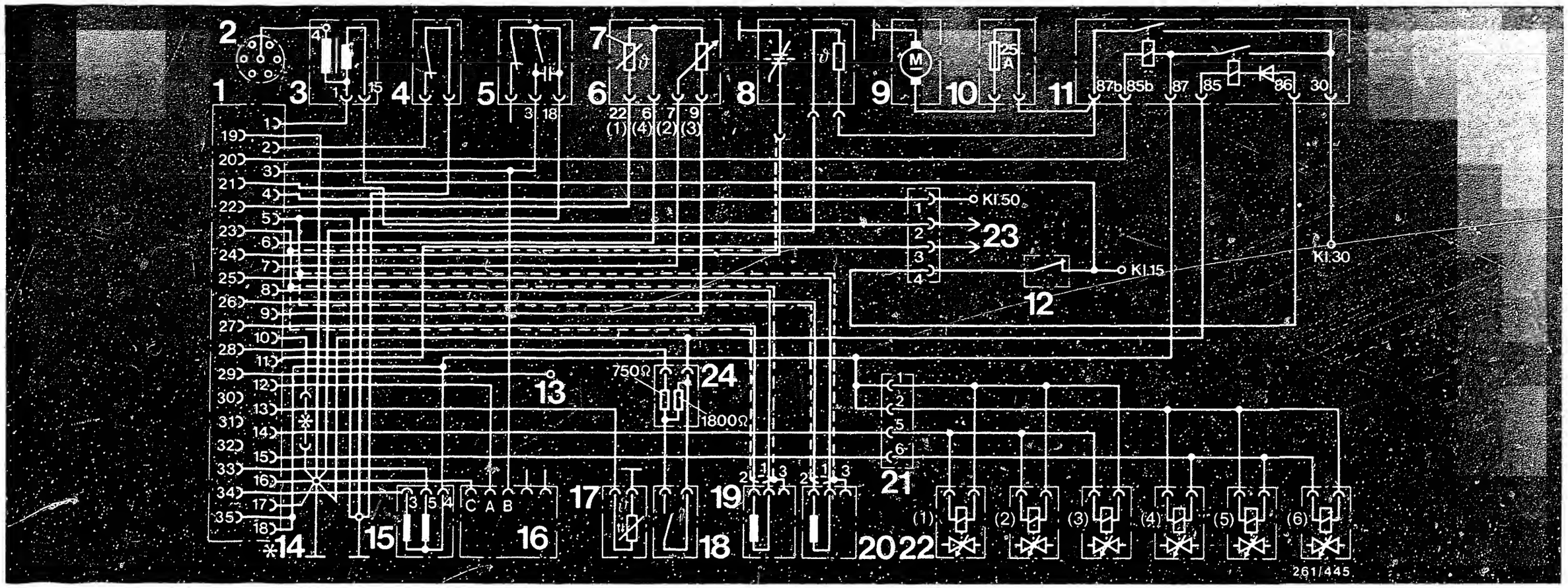
* Pressure regulator:
  At end of fuel-distribution pipe at left, near to 3rd cylinder.

* Altitude sensor: beneath driver's seat.
* Fuses: in trunk at left.
* Lambda sensor: in common exhaust pipe.

* Plug connection for lambda sensor: in engine compartment at left. Near sensor plug connection.

* Plug connection for term. 10:
  At control-unit plug.

* Adapter plug for term. 28:
  Between altitude sensor and control unit.



ELECTRICAL TERMINAL DIAGRAM

1 = Motronic control unit
2 = High-voltage distributor
3 = Ignition coil
4 = Microswitch (idle contact)
5 = Throttle-valve switch (full-load contact)
6 = Air-flow sensor
7 = Temperature sensor I (Air)
8 = Heated lambda sensor
9 = Electric fuel pump
10 = In fuse box Fuse No. 16
11 = Pump relay
12 = Alarm system (if installed)
13 = To air conditioner (+)
14 = Plug connection (partially connected - see variant coding)
15 = Idle actuator
16 = Test plug
17 = Temperature sensor II (Engine)
18 = Altitude sensor
19 = Speed sensor
20 = Reference-mark sensor
21 = Plug connection in engine compartment
22 = (1, 2, 3, 4, 5, 6) = Solenoid-operated injection valves
23 = Tachometer
24 = Adapter cable (partially installed - see variant coding)

F25 —⟹

F26 ⟸—

Always pay attention to SAFETY AND PRECAUTIONARY MEASURES in order to avoid damage to the engine, control unit or ignition coil, as well as to prevent danger to persons.

1. CAUTION!
   High-output ignition system with dangerous high and low voltages!

   Contact with components or terminals under voltage may be dangerous (both at the primary and secondary ends).

2. When testing the compression, disconnect the Motronic relay. In this way, undesired injection by the injection valves is avoided.

3. Never start engine when battery not firmly connected.

4. Incorrect polarity of the supply voltage, e.g. through incorrect connection of the battery or ignition coil, may lead to the destruction of the control unit.

5. Never use a fast charger for starting the engine. Provide starting aid only using a second 12 V battery and jump leads.
   Caution! Due to non-uniform demands of the vehicle manufacturer made on electronic products, we recommend that a 24 V battery never be used for providing starting aid. Observe the vehicle owner's manual.

6. Disconnect the battery from the vehicle electrical system before boost charging.

7. When charging the battery in the vehicle or providing starting aid, observe the instructions in the operating manual of the fast charger, as well as the instructions from the vehicle manufacturer.

8. Never disconnect the battery from the vehicle electrical system when the engine is running.

9. Never short circuit ignition coil term. 1 to ground (e.g. for switching off the engine). Ignition coil and, under certain circumstances, control unit are destroyed.

10. Never connect the positive battery terminal to ignition coil term. 1. Control unit is destroyed.

11. Never diconnect or connect wiring-harness plug of control unit when ignition is switched on.

12. When temperatures are above +80°C (drying oven), the control unit must be removed.

13. When welding (electric spot welding), the control unit must be removed.

14. When installing an alarm system, observe the installation instructions for Motronic vehicles or the SIS microcard ALL-500.
    Make sure that the alarm relay is not destroyed by external fields (e.g. from ignition cables) so that it responds in a defective manner.

T A B L E O F C O N T E N T S

Trouble-shooting instructions : MB-5010

BOSCH system : KE 3.1-Jetronic

Make of vehicle : MERCEDES-BENZ

Basic microcard : PKW-014

Test instructions	Coordinates
Special features	G02
Self-diagnosis / Rapid diagnosis chart	G07-G18
Test specifications	G03-G06
Electrical terminal diagram	G19-G22
Electrical wiring diagram	
Hydraulic-lines diagram	
Diagram of air / fuel lines	
Tools and test equipment	
Testing and adjustment instructions	
Installation position of components	G23-G25
Notes on removal and installation	
General important information	

Tests without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* This microcard contains the trouble-shooting instructions, valid at the time of publication, for the following Mercedes-Benz model:

  420 SEL, 4,2 1/8 Zyl. (USA,J,AUS) 09.85->

* Trouble-shooting with these instructions may only then take place when the details of the "Summary - Service Information for Vehicles" (KFZ-000) coincide with those of the vehicle type and with the BOSCH number of KE-Jetronic control unit installed.

* Control unit using digital techniques, characteristic-map control using microprocessor.

* Electronically controlled low-idle-speed control with single-winding rotary actuator, without bypass adjusting screw.

* Activated-carbon filter and regeneration valve for return of gasoline vapors into the intake manifold. (Fuel evaporation system)

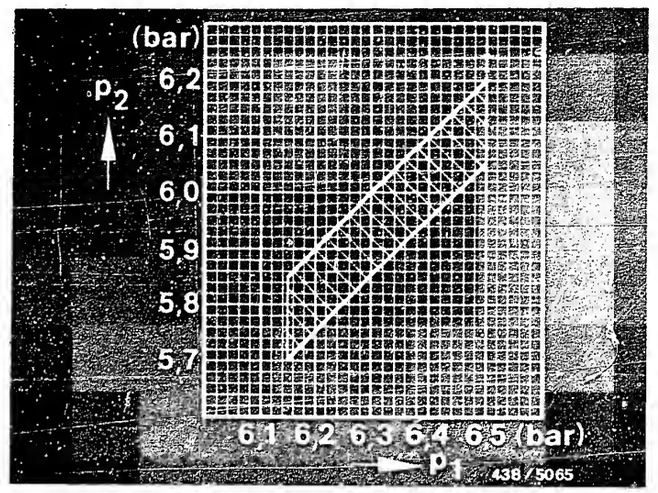
* Secondary-air injection

Important note:

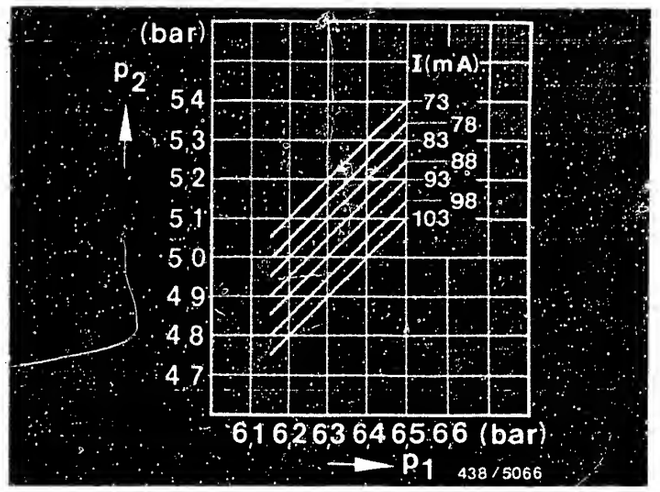
If reference is made to a basic microcard, always make certain you use the test specifications from the vehicle-specific brief instructions.

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification	
1	Electric fuel pump – fuel delivery:	At least 1650 cm ^{3} /min	
2	Primary pressure:	6,15...6,5 bar	
3	Differential pressure: Suppression of peak coil current: Actuate starting motor with fuel-pump relay disconnected. Do not switch off ignition after starting. Take lower-chamber pressure set value "warm" from top chart corresponding to primary pressure measured. (Actuator current 0 mA) Take lower-chamber pressure set value "cold" from bottom chart corresponding to primary pressure measured and actuator current. Tolerance ± 0.15 bar. Simulation of "cold" state: press push-button 3 at test adapter.		
4	Leakage test, complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 3,3 bar 3,2 bar.	
5	Injection valves, opening pressure:	3,7...4,8 bar	
6	Fuel deliveries, comparative measurement: (Actuator current 0 mA)	Setting point: (cm ^{3} /min)	Max. permis. delivery: (cm ^{3} /min)
	Idle: Part load: Full load:	6,0 40,0 100,0	6,8 42,5 109,0
	Min. delivery at max. air-flow sensor plate defl.:	140,0 cm ^{3} /min	



p_1 = Primary pressure
p_2 = Lower-chamber pressure



TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
7	Rate of flow, KE restriction:	130...150 cm^3 /min
8	Temperature sensor, air (NTC I): Air temperature +15...+30°C:	—— k Ω
9	Temperature sensor, engine (NTC II): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	 1,3...3,6 k Ω 250...390 Ω
10	Idle-mixture-adjusting screw basic setting: Fuel-distributor seat - needle bearing:	 22,6...22,8 mm
11	Idle adjustment: Low-idle-speed control (non-Bosch product). For testing, engine at norm. op. temperature Idle speed: Idle-actuator current at idle speed: Engage driving position, speed: Check lambda closed-loop control: Measurement with lambda closed-loop control tester (e.g. KDJE-P 600) and adapter lead (e.g. KDJE-P 600/52) at diagnosis socket outlet (pin 3). Alternatively: Current measurement using universal test adapter. Put fuel evaporation system out of operation. Determine on/off ratio (mean value) at n = 2500 min^{-1} . Deviation of on/off ratio (mean value) at idle compared to n = 2500 min^{-1} : Adjustment at idle-mixture-adjusting screw. After adjustment, repeat measurement.	 600...700 min^{-1} 700...1000 mA 450...550 min^{-1} +5...+15 %

SELF-DIAGNOSIS

All Daimler-Benz 8-cylinder engines have been equipped as of FD 552 with self-diagnosis using on-off ratio measurement.

Defective input signals of the KE-Jetronic control unit may be indicated at the lambda test output (diagnosis socket outlet, socket 3) using the lambda closed-loop control tester.

Short circuiting and breaks in lines are detected. Sporadically occurring faults (e.g. loose contact) are not detected. Output of the fault signals takes priority over output of the lambda closed-loop control signal.

The faults which can be indicated are not discussed in detail here, since the input signals of the KE-Jetronic control unit may be tested using the universal test adapter (rapid diagnosis chart).

However, should a constant on-off ratio be indicated when testing the lambda closed-loop control using on-off ratio measurement, the input signals of the KE-Jetronic control unit must be checked (rapid diagnosis chart).

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER
ETT 018.01 WITH KE3 ADAPTER LEAD
1 684 463 169 AND APPROPRIATE MULTITESTER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electric/electronic peripheral and control-unit functions of the the KE-Jetronic, inlcuding the lambda closed-loop control.

Important note on the rapid diagnosis chart:

The "Test conditions" column gives information as to in which test steps the control-unit plug must be connected/disconnected. Make absolutely certain that there is no current at the system when connecting or disconnecting, i.e. the ignition must be switched off and the electric safety circuit must not be short circuited.

The "Test connections" column provides information about the leads connected to the respective measuring path, referring to the assignment in the control-unit plug. Possibly necessary trouble-shooting is with regard to these leads.

A t t e n t i o n :

When carrying out the test, make sure that the trimming plug is in position 1.

Rapid diagnosis chart for universal test adapter ETT 018.01 (continued)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
1	| V	4	—	Internal resistance (R_i) pressure actuator	12–10	Disconnect control-unit plug.	20...30 Ω
2	| V	5	—	Resistance, temperature sensor (coolant)	21– 2	Engine temperature +15...30°C: approx. +80°C:	1,3...3,6 k Ω 250...390 Ω
3				Resistance, temperature sensor (intake air)		Air temperature in area of NTC I = +15...+30°C:	Test step not applicable
4	| V	6	—	Signal, altitude sensor	11– 2	Connect control unit. Switch on ignition. Voltmeter connection to blue Ω sockets. Signal altitude-dependent: 0 meters (sea level): 500 meters: 1000 meters: 1500 meters: 2000 meters: 3000 meters:	 3,2...4,5 V 2,8...4,0 V 2,4...3,5 V 2,0...3,0 V 1,5...2,5 V 0,8...1,6 V
5	| V	9	—	Throttle-valve switch, idle	13– 2	Switch off ignition. Disconnect control-unit lead plug. Throttle valve closed: open:	 0...10 Ω > 1000 Ω
6	| V	10	—	Throttle-valve switch, full load	5– 2	Throttle valve closed: fully open:	Ω 0...10 Ω
7	| V	11	—	Microswitch idle linkage	24– 2	Throttle valve closed: open:	——— Ω infinite Ω
8	| V	12	—	Ground, control unit	20– 2		0...10 Ω
9	| V	13	—	Ground, pin 7	7– 2	Switch of f ignition. Connect control unit.	0...10 Ω

Rapid diagnosis chart for universal test adapter ETT 018.01 (continued)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
10	⏐ V	14	–	Trimming plug Mixture map	22– 2	Disconnect control-unit plug. Disconnect lead plug from air-flow sensor potentiometer and connect socket 1 of plug (in upper installation position) to engine ground. Trimming-plug position 1: 2: 3: 4: 5: 6: 7:	 0...10 Ω ——— Ω ——— Ω ——— Ω ——— Ω ——— Ω ——— Ω
11	⏐ V	15	–	Transmission switch (only automatic transmission)	16– 2	Connect air-flow sensor potentiometer. Selection lever position P, N: Driving position selected:	 0...10 Ω infinite Ω
12	5	–	–	TD signal	25– 2	Start engine (starting motor):	Voltage undefined
13	6	–	–	Control-unit supply	1– 2	Switch on ignition:	8...15 V
14	7	–	–	Idle actuator supply and continuity	3– 2	Switch on ignition:	——— V
15	8	–	–	Tempomat signal	6– 2	Switch Tempomat operation:	——— V
16	9	–	–	Air-conditioner cut-in signal	19– 2	Switch off ignition. Connect control unit. Start engine, switch on air conditioner. Temperature regulator = Minimum temperature	 ——— V
17	10	–	–	Supply, air-flow sensor potentiometer	18– 2	Switch on ignition:	4,35...5,25 V

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
18	11	–	–	Signal, air-flow sensor potentiometer	17– 2	Switch on ignition. Air-flow sensor plate in neutral position: Defect air-flow sensor plate by hand, continuous voltage rise up to max.:	0 V 5,35 V
19	13	–	1	Temperature signal form control unit	9– 2	Switch on ignition. While actuating btn 1:	1,5...1,9 V
20	14	–	–	Consumption signal	4– 2	Start engine – idle: With regulation:	Voltage indefined Voltage change
21	–	–	–	Peak coil current	12–12	Switch on ignition:	->FD ——: ——— mA FD 545 ->: 65...85 mA
22	–	–	1	Warm-up enrichment + 20°C	12–12	Warm up engine – idle. Current value with btn 1 pressed:	->FD 549: 8...12 mA FD 550 ->: 3...5 mA
23	–	24	2	Actuator current Engine at norm. op. temp.	12–12	Engine at norm. op. temp., idle. Current value with btn 2 pressed; reading oscillating, mean value:	->FD ——: ——— mA FD 545 ->: -1...+1 mA
24	–	21	1	Starting enrichment	12–12	So that engine fails to start: Disconnect speed relay for electric fuel pump. Short circuit ignition coil term. 4 to ground via resistance of at least 2 k Ω . (e.g. with sleeve-type suppressor and spark gap) While btn 1 pressed, actuate starting motor. Current rise (max. 1 sec.) to:	->FD ——: ——— mA FD 545 ->: 120...150 mA

*) FD = Date of manufacture

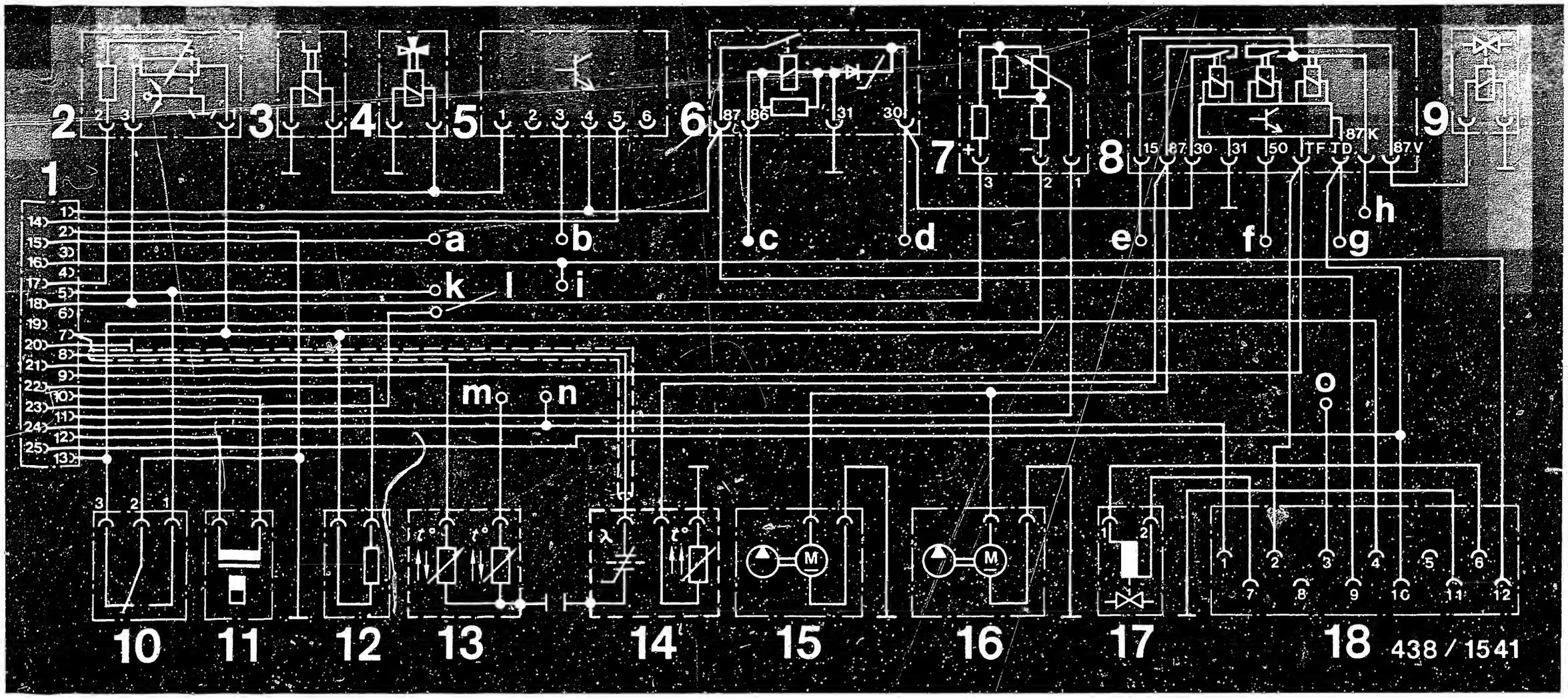
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
25	–	21	1	Post-start enrichment	12-12	Start engine (at normal operating temperature) while actuating btn 1. Current value: Current value constant for approx: Then slow speed regulation to:	 ->FD 549: 40...50 mA FD 550 ->: 30...40 mA ->FD 549: 3... 9 s FD 550 ->: 10...16 s ->FD 549: 8...12 mA FD 550 ->: 3... 5 mA
26	–	21	1	Acceleration enrichment	12-12	Engine at normal operating temperature, idle. While actuating btn 1, perform snap acceleration of engine. Thus current rise (approx. 1 s) to: Note: Level of current value dependent upon intensity of acceleration (travel/duration of air-flow sensor flap movement).	 ->FD ——: ——— mA FD 545 ->: 50...70 mA
27	–	–	–	Overrun cut-off	12-12	Re-connect ammeter (swap positive and negative) Start engine (normal operating temperature). Speed n to approx.: Hold there. Manually actuate idle throttle-valve switch (for 4- and 6-cyl. engines, microswitch at accelerator linkage). Engine hunts. Current reading during falling speed phase:	 ->FD ——: ——— min $^{-1}$ FD 545 ->: 1700 min $^{-1}$ -40...-80 mA

*) FD = Date of manufacture

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specification CAT
28	–	24	–	Full-load enrichment	12-12	Engine at normal operating temperature, idle. Reading oscillating, mean value: Briefly push accelerator pedal to floor (full-load throttle-valve switch must switch). During speed rise, current value rises by: A t t e n t i o n: Do this very briefly, so that speed does not rise too much and engine is not damaged.	 –>FD ——: ——— mA FD 545 –>: –1...+1 mA –>FD ——: ——— mA FD 545 –>: 3... 6 mA
29	–	21	–	Lambda closed-loop control, open-loop control mode	12-12	Disconnect regeneration lead to throttle-valve assembly at generation valve and seal. Engine at norm. op. temp., idle. Current value:	 – 1...+ 1 mA
30	–	24	–	Lambda closed-loop control, closed-loop control mode	12-12	Engine at norm. op. temp., idle. Closed-loop control mode can be recognized from the oscillating current reading. Mean value: If mean value outside tolerance, set (idle-mixture-adjusting screw) to approx.:	 – 1...+ 1 mA 0 mA
31	–	22	–	Lambda closed-loop control, rich stop	12-12	Engine at norm. op. temp., idle. Current rise to:	10...14 mA
32	–	23	–	Lambda closed-loop control, lean stop	12-12	Engine at norm. op. temp., idle. Current drop to:	–10...–14 mA

*) FD = Date of manufacture

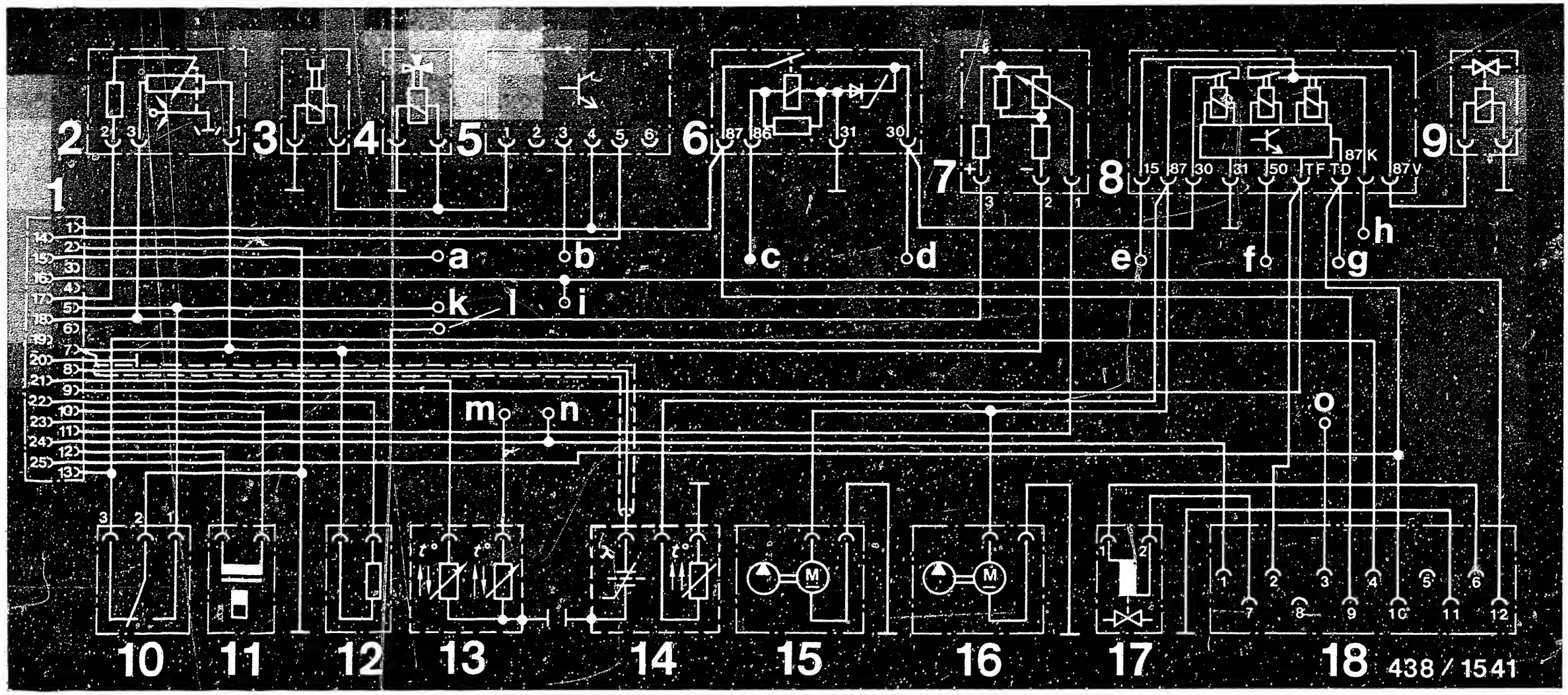


1 = Control unit, KE-Jetronic
2 = Air-flow sensor potentiometer
3 = Electro-magnetic coupling, air pump
4 = Change-over valve, air pump
5 = Relay, air injection
6 = Over-voltage protection relay
7 = Altitude sensor
8 = Electronic relay
9 = Cold-start valve
10 = Throttle-valve switch, idle/full load
11 = Electro-hydraulic pressure actuator
12 = Trimmer resistor, mixture map
13 = Temperature sensor, coolant (Double NTC)
14 = Heated lambda sensor
15 = Electric fuel pump
16 = Electric fuel pump
17 = Idle actuator (non-Bosch product)
18 = Control unit, low-idle-speed control (non-Bosch product)

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT

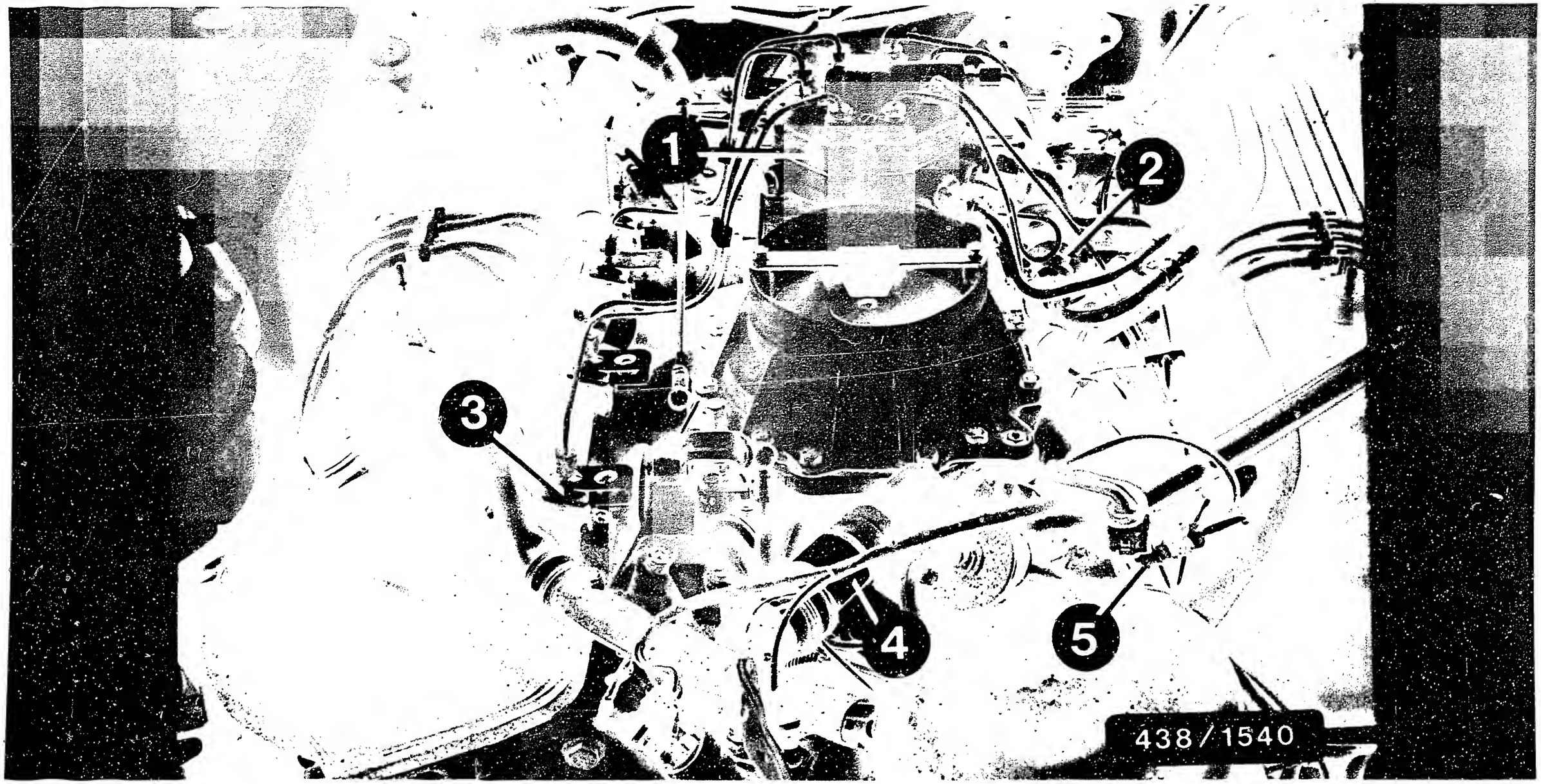
G19 ⟹

G20 ⟺



a = Lambda malfunction indicator
b = Terminal 15
c = Terminal 15
d = Terminal 30
e = Terminal 15
f = Plug connection, start-locking switch, socket 4
g = Terminal TD, ignition
h = Kick-down switch, socket 1
i = Plug connection, start-locking switch, socket 3
k = Trigger box, ignition system
l = Lambda test output (diagnosis socket outlet, socket 3)
m = Trigger box, ignition system
n = Speed signal
o = Control unit, compressor cutoff

Electrical terminal diagram with electric fuel pump safety circuit (continued)



1 = Mixture-control unit
2 = Pressure regulator
3 = Injection valve
4 = Idle actuator (non-Bosch product)
5 = Cold-start valve

INSTALLATION POSITION OF COMPONENTS

Installation position of further components

KE-Jetronic control unit:
In footwell at right behind the side panel.

Relay, electric fuel pump:
In engine compartment at left.

Relay, over-voltage protection:
In engine compartment at left.

Temperature sensor, engine (NTC II):
At left (referring to forward direction of travel) at rear at cylinder head.

For production reasons:
continued on the following coordinate.

G25 — <==

G26 — => <=

T A B L E O F C O N T E N T S

Trouble-shooting instr. : MB-5009

BOSCH system : Air-conditioning control and air conditioner (Tempmatik)

Make of vehicle : MB Type W126 9.85->

Basic microcard : MB-513

Test instructions	Coordinates
Special features	H02
Rapid diagnosis chart	H03
Test specifications	H11
Electrical terminal diagram	H13
Test equipment	H17
Installation position of components	H19

Special features

This microcard contains the trouble-shooting instructions for the electronic automatic heater and air conditioner (Tempmatik) in Mercedes-Benz vehicles, Type 126 (300SE ... 560 SEC) as of 09.85

Actuation of the refrigerant compressor has been changed for all the vehicles and an additional control unit with the following functions has been installed for compressor cutoff:

* 6-cylinder engine

  To protect the single-belt drive, the refrigerant compressor is switched off when its movement is sluggish.

* 8-cylinder engine

  In order not to overload the engine thermically, the refrigerant compressor is switched off at approx. 115 °C and switched on again at approx. 108 °C.
  In addition, the refrigerant compressor is switched off when an engine speed of 5750 min^{-1} is exceeded and switched on again when the engine speed is below 5550 min^{-1}.

The compressor-cutoff control unit is actuated by the air-conditioner control unit by connecting to ground.

Rapid diagnosis chart for heater test adapter and air-conditioner test adapter

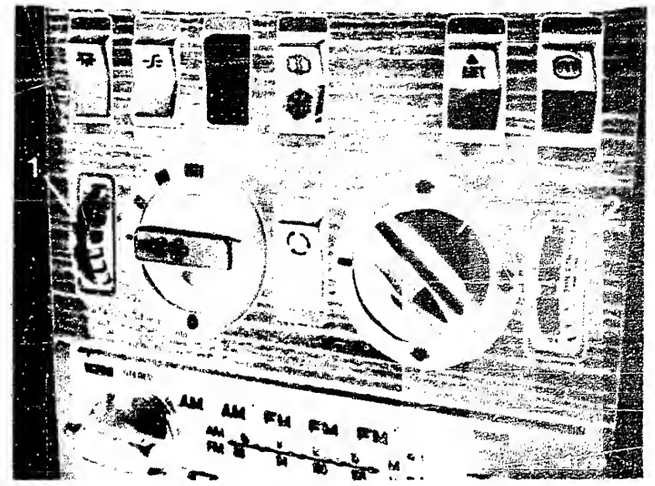
The following rapid diagnosis chart makes it possible for the experienced expert to quickly check the system using the test adapter KDHK 0001.
The contents of this chart are limited to the following details:

- Test step sequence
- Switch position at adapter
- Test instructions and test specifications (readings at adapter)
- Instructions for eliminating trouble

Test requirement

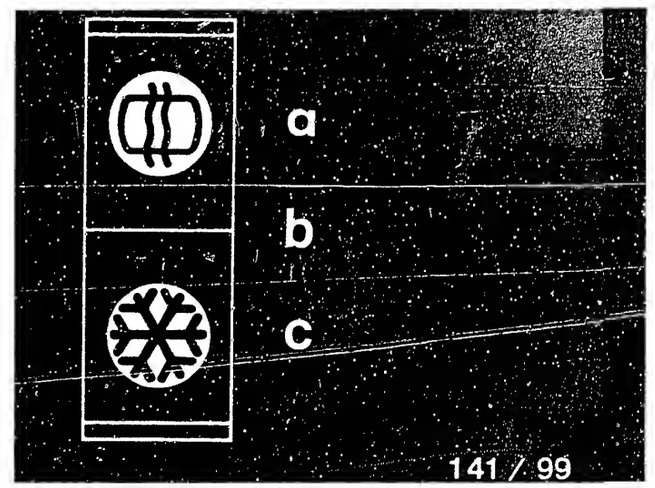
- Check customer complaints (check function of automatic heater and air conditioner in accordance with vehicle owner's manual)
- Coolant level correct
- Refrigerant level correct
- Engine running and at normal operating temperature
- Electrical system (fuses, battery voltage) O.K.
- Blower switch in position IIII and blower running at max. speed
- Left-hand and right-hand temperature selectors approximately in center position (22)
- Air-distribution switch to footwell position
- Fresh-air/ventilation switch to fresh-air position
- Air-conditioner switch to position "a" (refrigerant compressor on)

When disconnecting plug connections, the ignition must be switched off.
Disconnect control-unit plug (12-pin) and connect to adapter lead KDHK 0008.
Disconnect control-unit plug (4-pin) and connect to adapter lead KDHK 0012 via adapter cable KDHK 0008 . Connect adapter lead KDHK 0008 to test adapter KDHK 0001.



1 = Temperature selector, left
2 = Temperature selector, right
3 = Air-conditioner switch
5 = Fresh-air/ventilation switch
6 = Blower switch
21 = Air distribution switch

AIR-CONDITIONER SWITCH
a = Compressor on
b = Compressor off
c = Compressor on as required



RAPID DIAGNOSIS CHART FOR ELECTRONIC AUTOMATIC HEATER AND AIR CONDITIONER (TEMPMATIK)

Test adapter KDHK 0001 with adapter lead KDHK 0008 and adapter lead KDHK 0012

Test step	Rotary-switch position	Under test	Test instructions	Reading Test specification	Instructions for eliminating trouble
1	1	Supply voltage, electronic control unit	Engine running and at normal operating temperature	10...15	Check fuses. Check leads for short circuit and open circuit.
2	2	Interior temperature sensor	Auxiliary switch in adapter lead to position "I"	5...11	Check leads for short circuit and open circuit. Check resistance of temperature sensor: 8...16 k Ω at 15...30 °C
2.1			Spray refrigerant spray into interior temperature sensor	Falls during cooling down	
2.2			Check ventilation of interior temperature sensor (with strip of paper)	Strip of paper drawn towards nozzle	Check air-flow nozzle and/or suction blower and hose connectn.
3	3	Temperature selector, left	Turn temperature selector. Reading must change uniformly between min. and max. After testing, return temperature selector to center position (22).	Approx. 1,5...8 Min. approx. 1 Max. approx. 9	Eliminate short circuits and open circuits in the leads. If reading erratic, replace temperature selector.
4	4	Temperature selector, right	Turn temperature selector. Reading must change uniformly between min. and max.. After testing, return temperature selector to center position (22).	Approx. 1,5...8 Min. approx. 1 Max. approx. 9	Eleminate short circuits and open circuits in the leads. If reading erratic, replace temperature selector.
5	5	Evaporator temperature sensor		5...12	Eliminate short ciruits and open circuits in the leads. Resistance value, temperature sensor 2,5...4,5 k Ω at 10...35 °C
6	6	Heating-water pump	Switch on auxiliary switch (S) at test adapter. Heating-water pump running - check by feeling/listening.	0...3	Eliminate short circuits and open circuits in the leads. Replace heating-water pump.
6.1			Switch off auxiliary switch (S) at test adapter. Heating-water pump not running - check by feeling/listening.	9...14	

RAPID DIAGNOSIS CHART FOR ELECTRONIC AUTOMATIC HEATER AND AIR CONDITIONER (TEMPMATIK) (Continued)

Test adapter KDHK 0001 with adapter lead KDHK 0008 and adapter lead KDHK 0012

Test step	Rotary-switch position	Under test	Test instructions	Reading Test specification	Instructions for eliminating trouble
7	7	Heating-water valve, left	Blower switch to position IIII Switch on auxiliary switch (S) at test adapter. No heating effect, left - check by feeling.	0...3	Eliminate short circuits and open circuits in the leads.
7.1			Switch off auxiliary switch (S) at test adapter. Heating effect, left - check by feeling.	9...14	Replace heating-water pump.
8	8	Discharge temperature sensor, left	Test step must directly follow 7.1 (water in heat exchanger must be hot at start of test).	7...12 Falls slowly	Eliminate short circuits and open circuits in the leads. Resistance value, temperature sensor: 8...16 k Ω at 15...30° C
9	9	Heating-water valve, right	Switch on auxiliary switch (S) at test adapter. No heating effect, right - check by feeling.	0...3	Eliminate short circuits and open circuits in the leads.
9.1			Switch off auxiliary switch (S) at test adapter. Heating effect, right - check by feeling.	9...14	Replace heating-water valve.
10	10	Discharge temperature sensor, right	Test step must directly follow 9.1 (water in heat exchanger must be hot at start of test).	7...12 Falls slowly	Eliminate short circuits and open circuits in the leads. Resistance value, temperature sensor: 8...16 k Ω at 15...30° C
11	12	Magnetic coupling, refrigerant compressor	Air-conditioner switch in position "a" (AC operation) Switch on auxiliary switch (S) at test adapter. Refrigerant compressor must switch on (wait for response time approx. 10 s.) Discharge air is greatly cooled - check by feeling.	0...3	Eliminate short circuits and open circuits in the leads. If no fault can be found in cable set, try replacing compressor-cutoff control unit.
11.1			Switch off auxiliary switch (S) at test adapter. Refrigerant compressor must switch off. Discharge air is not longer cooled - check by feeling.	9...14	

RAPID DIAGNOSIS CHART FOR ELECTRONIC AUTOMATIC HEATER AND AIR CONDITIONER (TEMPMATIK) (Continued)

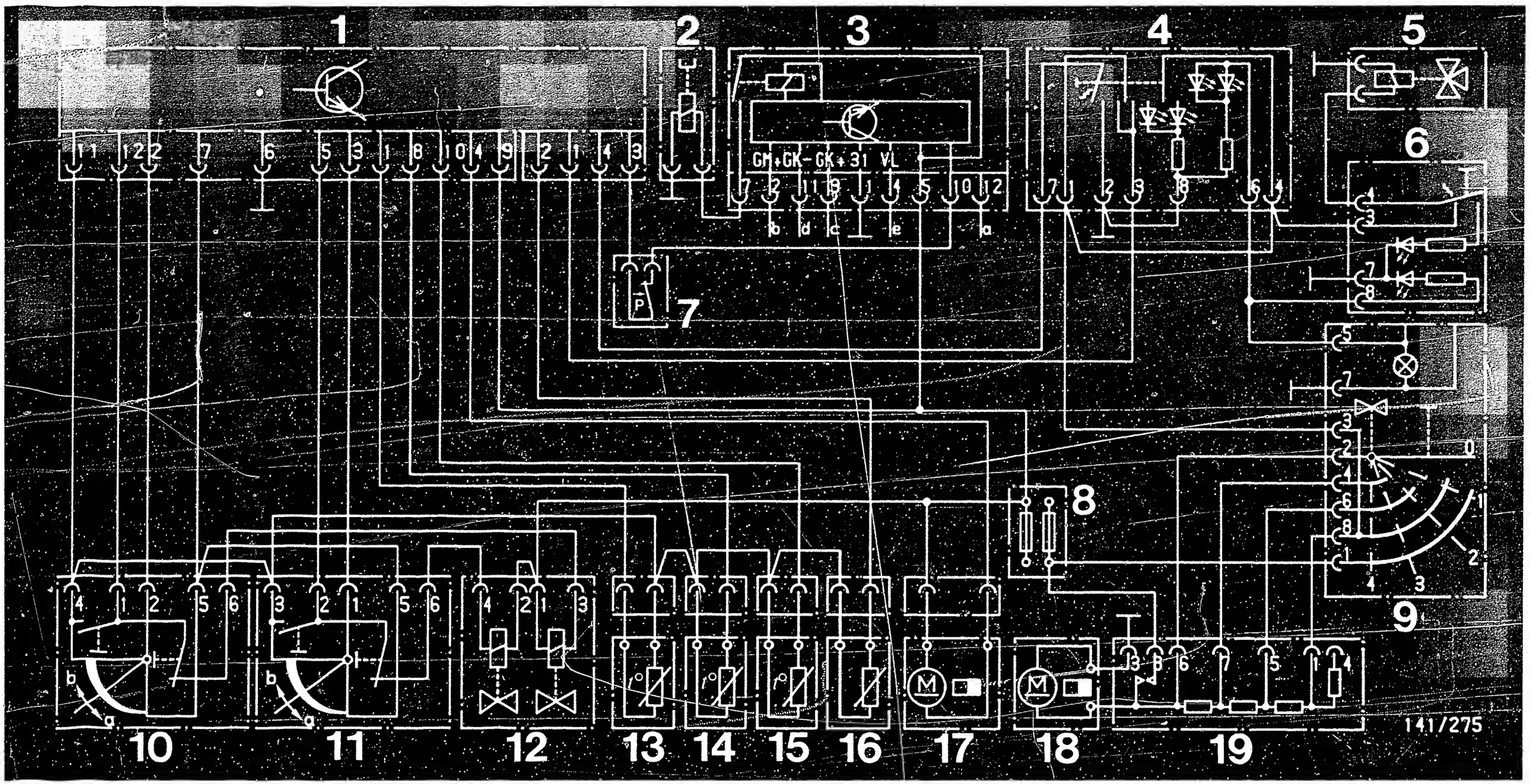
Test adapter KDHK 0001 with adapter lead KDHK 0008 and adapter lead KDHK 0012

Test step	Rotary-switch position	Under test	Test instructions	Reading Test specification	Instructions for eliminating trouble
12	13	Air-conditioner switch	Air-conditioner switch in position "a" (AC operation)	10...15	Eliminate short circuits and open circuits in the leads. Replace air-conditioner switch.
12.1			Air-conditioner switch in position "c" (EC operation)	0... 3	
12.2			Air-conditioner switch in position "b" (DEF operation)	0... 3	
13	15	Voltage supply, refrigerant-compressor actuation	Air-conditioner switch in position "c" (EC operation)	0... 3	
13.1			Air-conditioner switch in position "b" (DEF operation)	10...15	
13.2			Air-conditioner switch in position "a" (AC operation)	10...15	

TEST SPECIFICATIONS

	Internal resistance	
Interior temperature sensor	at	16... 8 kΩ 15... 30 °C
Discharge temperature sensor	at	2,5...4,5 kΩ 15... 28 °C
Evaporator temperature sensor	at	16... 8 kΩ 15... 30 °C
Heating-water valve	Approx.	11... 19 Ω
Heating-water pump	Approx.	4... 6 Ω
Temperature selector, total resistance	Approx.	9... 11 kΩ
	Switching points	
Temperature switch:		
-for auxiliary fan (6-cylinder engine) (8-cylinder engine)		110 °C 105 °C
-for compressor emergency cutoff (only 8-cyl. eng.)		115 °C
Pressure switch, compressor	Off at On at	2,0 bar 2,6 bar
Pressure switch, auxiliary fan	Off at On at	15 bar 20 bar

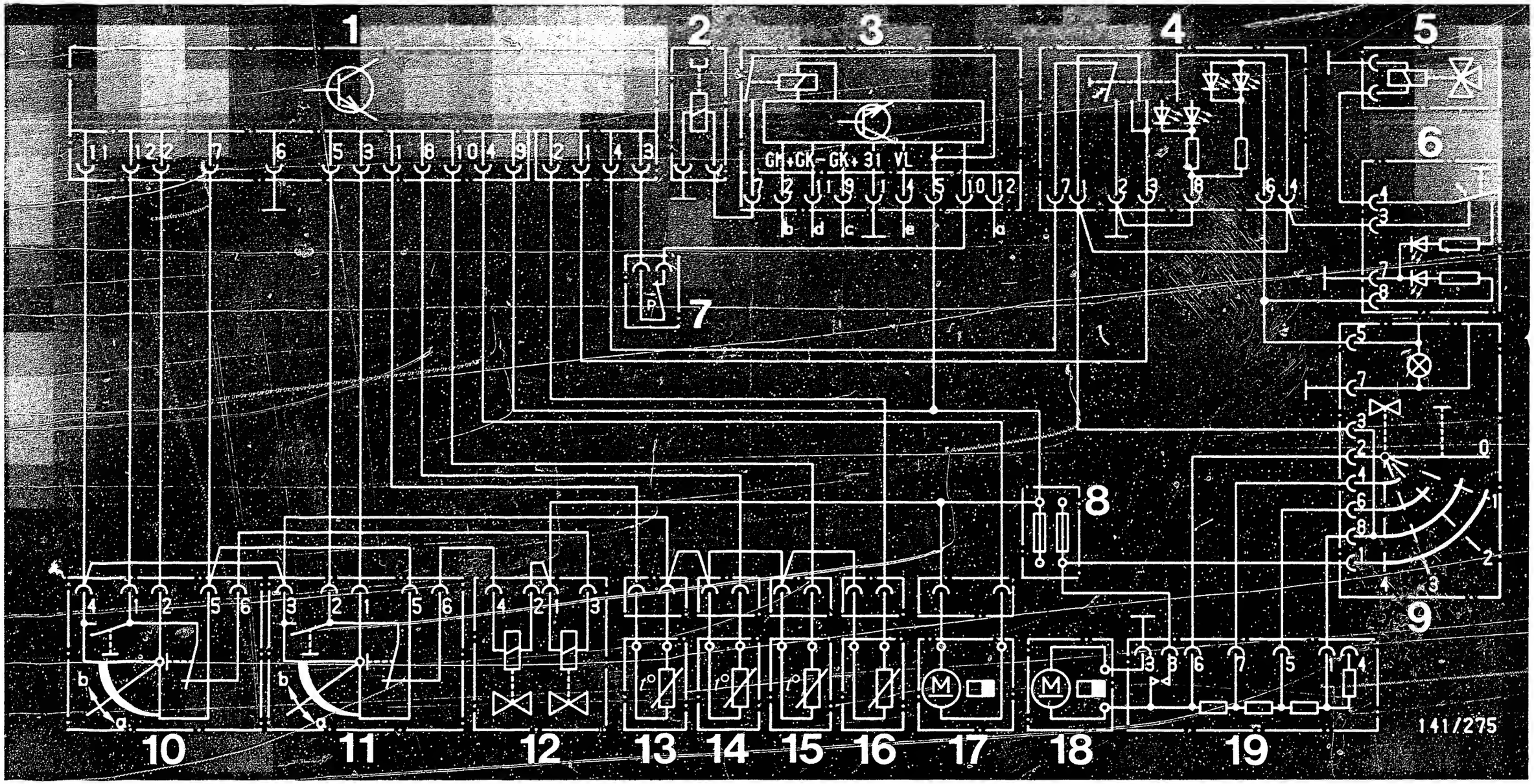
For production reasons:
continued on the following coordinate.



ELECTRICAL TERMINAL DIAGRAM FOR AIR-CONDITIONING CONTROL AND AIR CONDITIONER

3 = Control unit, compressor cutoff
a = To temperature switch (coolant 115°C, 8-cylinder engine)
b = Input TD signal
c,d = To speed sensor, refrigerant compressor (6-cylinder engine)
e = To control unit, injection system term. 19 (6-cylinder engine) to control unit, idle-speed control term. 3 (8-cylinder engine)
4 = Air-conditioner switch
5 = Change-over valve for main air flaps
6 = Fresh-air/ventilation switch
9 = Blower switch
10 = Temperature selector, left
11 = Temperature sensor, right

H13 ⟹
H14 ⟺



ELECTRICAL TERMINAL DIAGRAM FOR AUTOMATIC HEATER AND AIR CONDITIONER (Continued)

1 = Control unit, automatic heater and air conditioner
2 = Magnetic coupling, refrigerant compressor
7 = Pressure switch, refrigerant compressor
8 = Main fuse box
12 = Duo heating-water valve
13 = Discharge temperature sensor, left
14 = Discharge temperature sensor, right
15 = Interior temperature sensor
16 = Evaporator temperature sensor
17 = Heating-water pump
18 = Blower motor
19 = Series resistor, blower motor

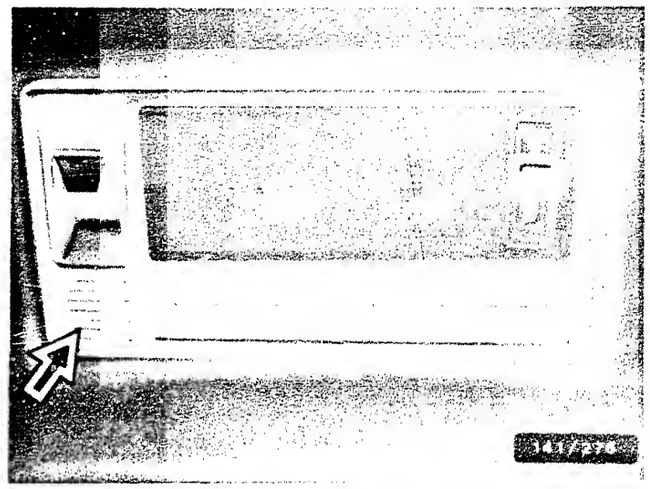
TEST EQUIPMENT AND AIDS

Multimeter e.g. ETE 014.00 or Pontavi	 0 684 101 400 commercially available
Heater/air-conditioner test adapter	KDHK 0001
Adapter lead	KDHK 0008
Adapter lead	KDHK 0012
Refrigerant spray	commercially available

For production reasons:
continued on the following coordinate.

INSTALLATION POSITION OF COMPONENTS

The interior temperature sensor is installed in the roof in the operating element of the interior lamp (upper illustration, arrow)

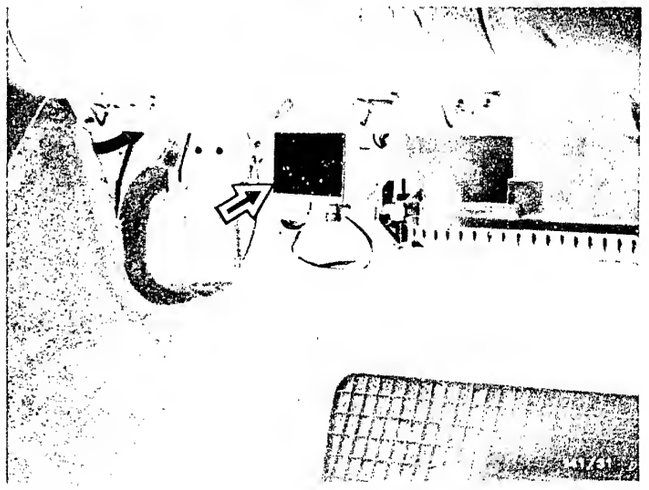


The Duo heating-water valve and the heating-water pump are installed at the right (referring to forward direction of travel) in the engine compartment (center illustration, arrows).



The electronic control unit is positioned beneath the glove compartment behind the footwell panel (lower illustration, arrow)

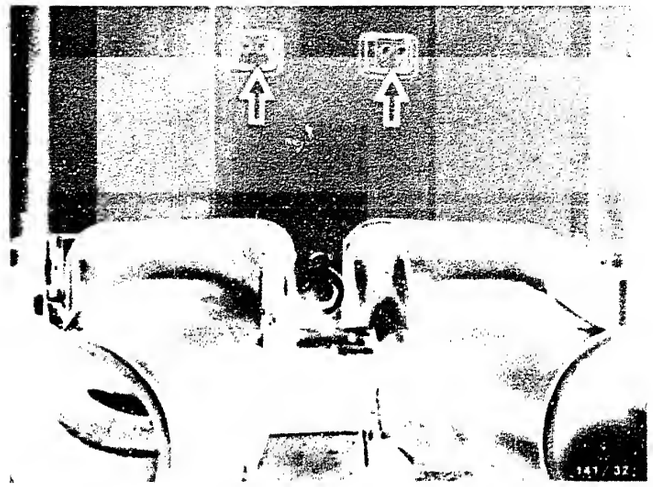
The compressor-cutoff control unit (no illustration) is installed in the engine compartment.



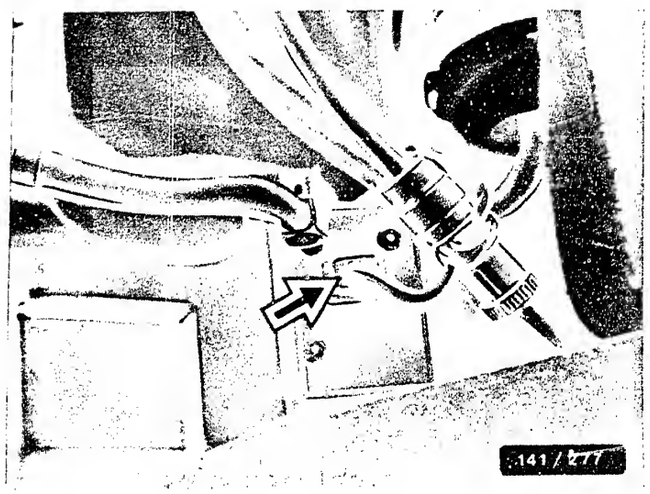
INSTALLATION POSITION OF COMPONENTS (Continued)

The discharge temperature sensors (left and right) are positioned in the heater housing (upper illustration, arrows)

Note: Discharge temperature sensors are accessible only after removal of the center console cover (ashtray, switches and radio must be removed).



The evaporator temperature sensor is positioned in the evaporator housing like the discharge temperature sensors (upper illustration, arrow)



T A B L E O F C O N T E N T S

Trouble-shooting instructions : REN-5000

BOSCH system : VE..F.. pump

Make of vehicle : RENAULT

Test instructions	Coordinates
Special features	J02
Test specifications	J02
Terminal diagram, preheating system	J05
Tools	J07
Removing injection pump	J08
Installing injection pump	J13
Checking / Adjusting engine timing	J21

1. SPECIAL FEATURES

* This microcard contains the trouble-shooting instructions, valid at the time of publication, for the following Renault models with diesel engine F8M 1.6 L 44 kW (55 bhp):
  Renault R 5 (09.85->)
  Renault Express (03.86->)

2. TEST SPECIFICATIONS

2.1 Idle speed: 825...875 min $^{-1}$
Fast idle 1100...1200 min $^{-1}$

2.2 Nozzle-opening pressure: 130 + 8 bar

2.3 Coordination, pump - engine (injection timing):
2.3.1 Testing/adjusting "static"
Engine position: Cyl. 1 at TDC

Setting value:
Pump position: 0.63...0.67 mm after BDC

Check value:
Pump position: 0.65 mm after BDC

2.3.2 Testing "dynamic"
Engine speed 825...875 min $^{-1}$
Start of injection 10.5...12.5° before TTC

2.4 Compression: min. of 20 bar
max. error per cylinder 4 bar

2.5 Cold-start device

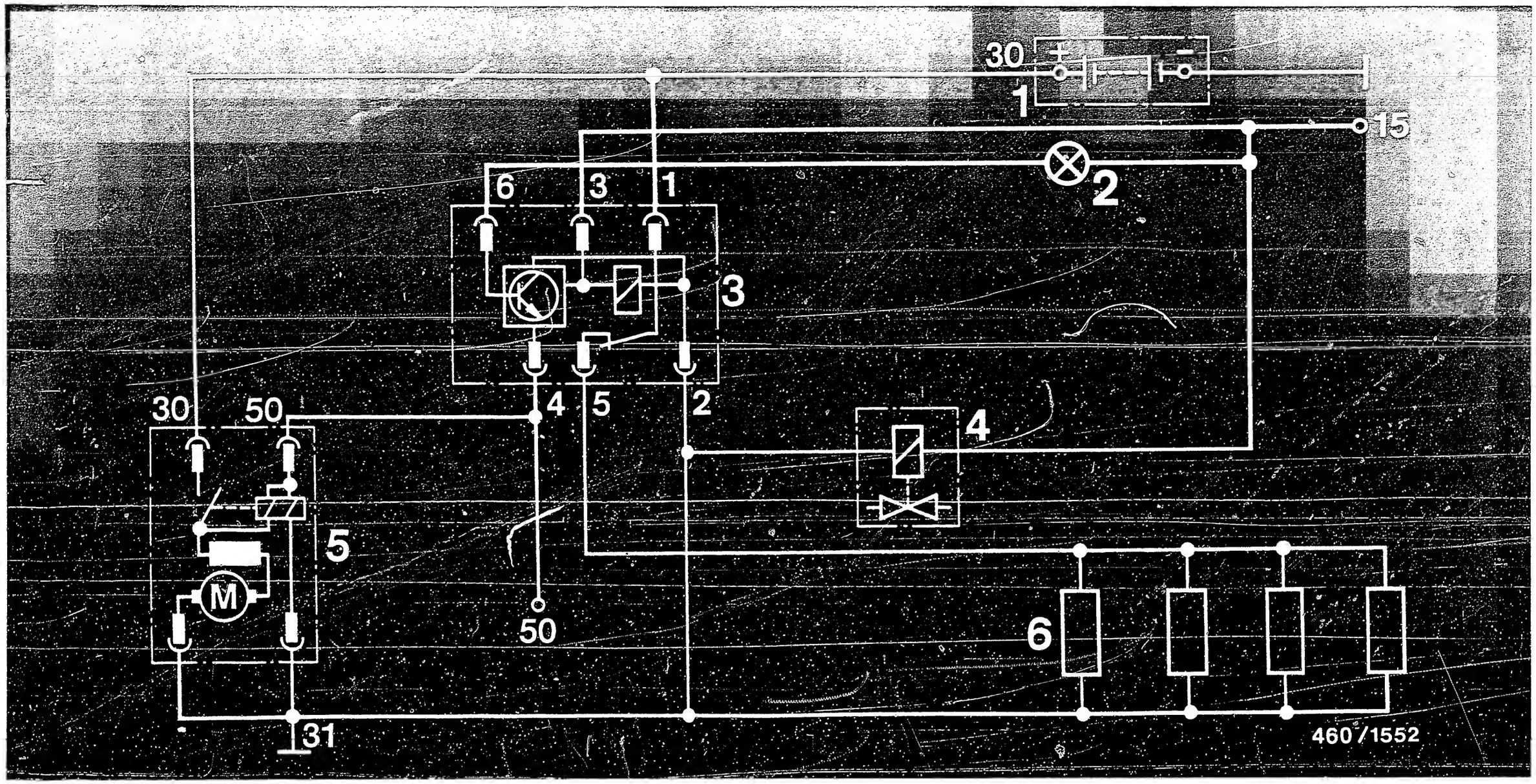
Engine speed	Ambient temp.	Cut-in time	Thermo-couple
above 2000 min $^{-1}$	above + 35°C up to +20°C up to-20°C	no function 30 s. 165 s.	23 Ohms

2.6 Toothed-belt tension
Scale interval 13...14

2.7 Tightening torques

Injection-pump gear (Hexagon nut)	50 Nm
Fuel lines	25 Nm
Fastening screws of injection pump	25 Nm
Cylinder-head cover	3...6 Nm
Screw plug	10 Nm
Nozzle-holder assembly	65...75 Nm
Angle bracket of injection pump	25 Nm
Toothed-belt tensioning roller	40 Nm
Hollow screws, fuel lines	25 Nm
Pulley, crankshaft	100 Nm

For production reasons: continued on the following coordinate.



1 = Battery
2 = Preheating repeater lamp
3 = Glow-time control unit
4 = Solenoid-operated valve
5 = Starting motor
6 = Sheathed-element glow plugs

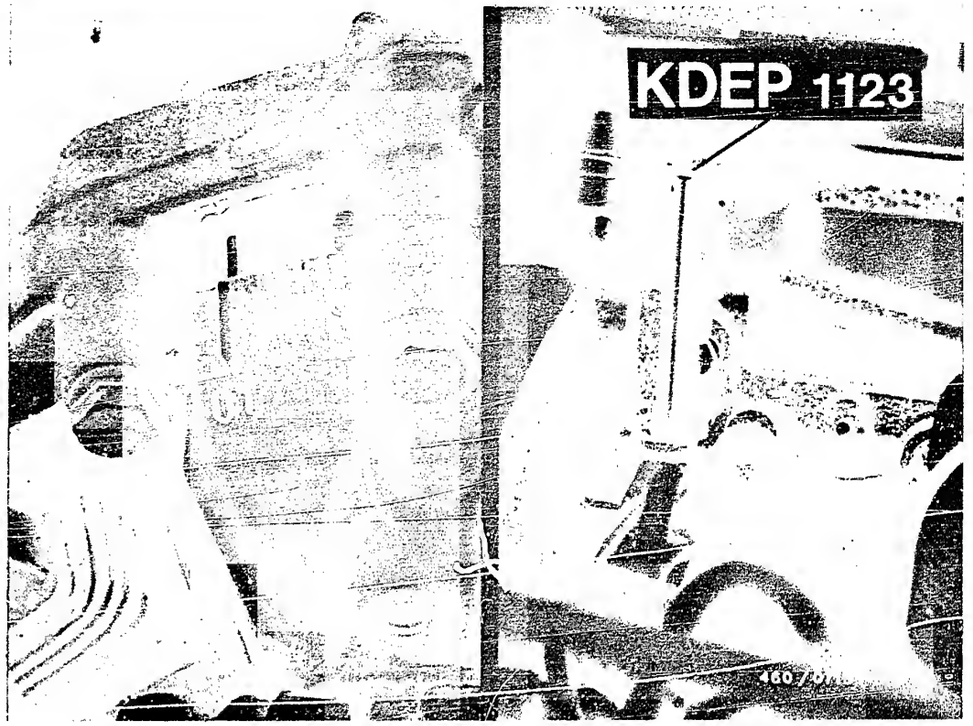
3. TERMINAL DIAGRAM FOR PREHEATING SYSTEM

J05 —⟹
J06 ⟸—

4. TOOLS

Description	Part number	Application
Puller	KDEP 1118	Pulling off injection-pump gear
Setting mandrel	KDEP 1123	Locking crankshaft
Holding device	KDEP 1147	For securing pump drive gear
Measuring tool	KDEP 1085	Coordination, pump - engine
Toothed-belt tester	KDEP 1121	Checking toothed-belt tension
Box wrench	KDEP 1115	Loosening/ tightening fuel-injection tubing

* When using a setting mandrel with overall length of 150 mm, shorten handle length by 50 mm due to altered installation position of engine.



5. REMOVING INJECTION PUMP

Disconnect negative cable at battery.

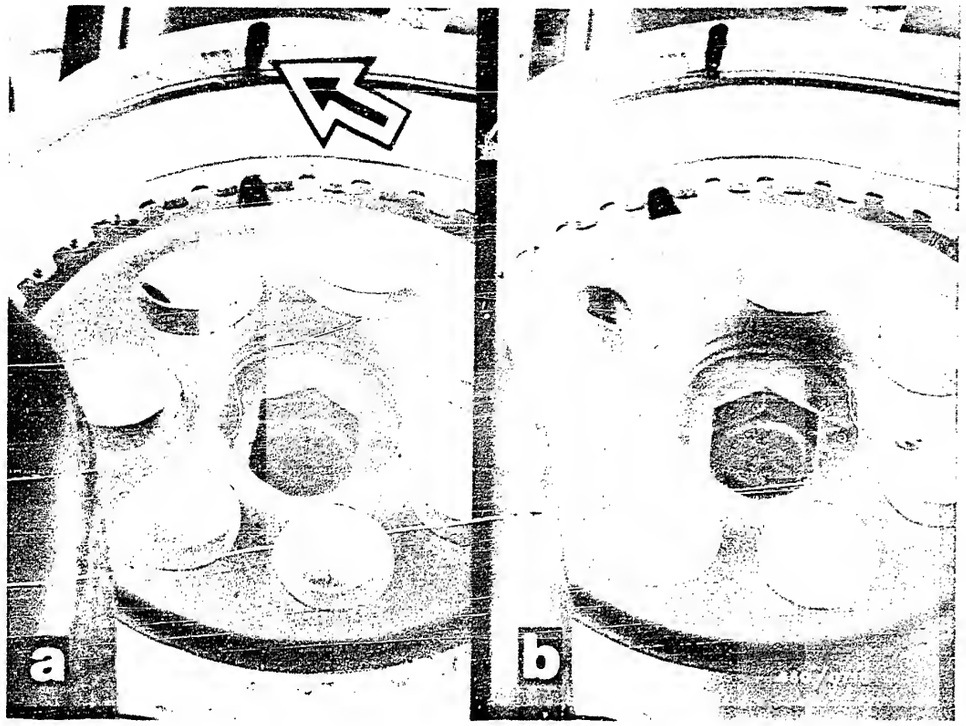
Remove toothed-belt protective cover and fuel filter.

4. Shift into gear and chock up left-hand front wheel.

By turning the front wheel, position piston of cylinder 1 (flywheel end) to TDC (left-hand illustration).

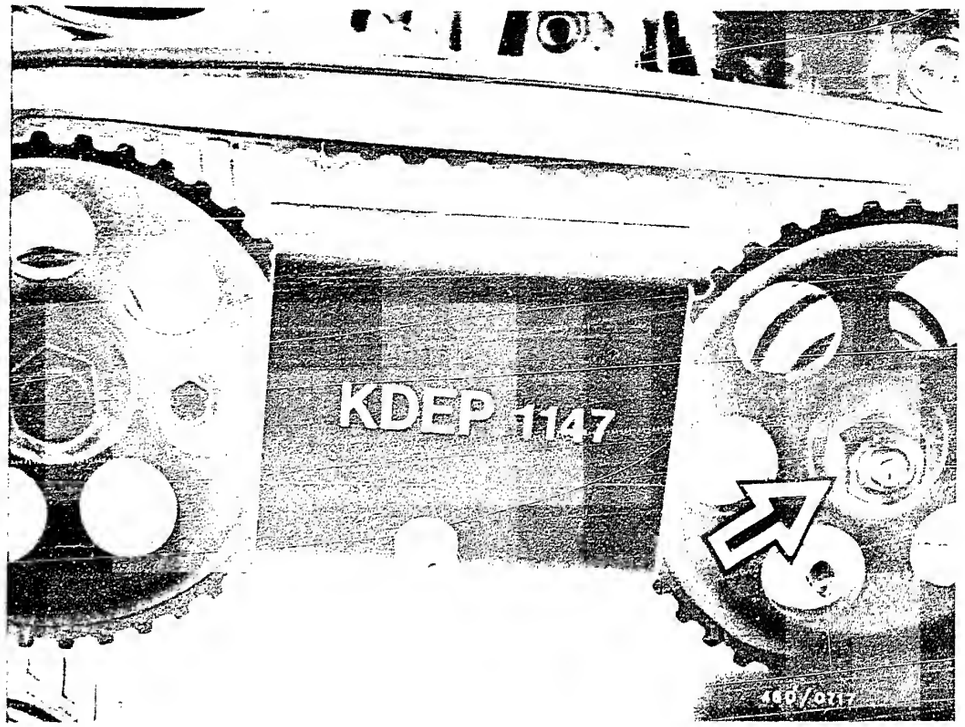
Check position of crankshaft using setting mandrel KDEP 1123 (right-hand illustration).

To do this, unscrew screw plug at engine block (near to flywheel).



At TDC, transfer markings on camshaft gear and injection-pump gear to timing-gear cover (illustration a, arrow).

Afterwards, turn timing gears back one tooth (illustration b).

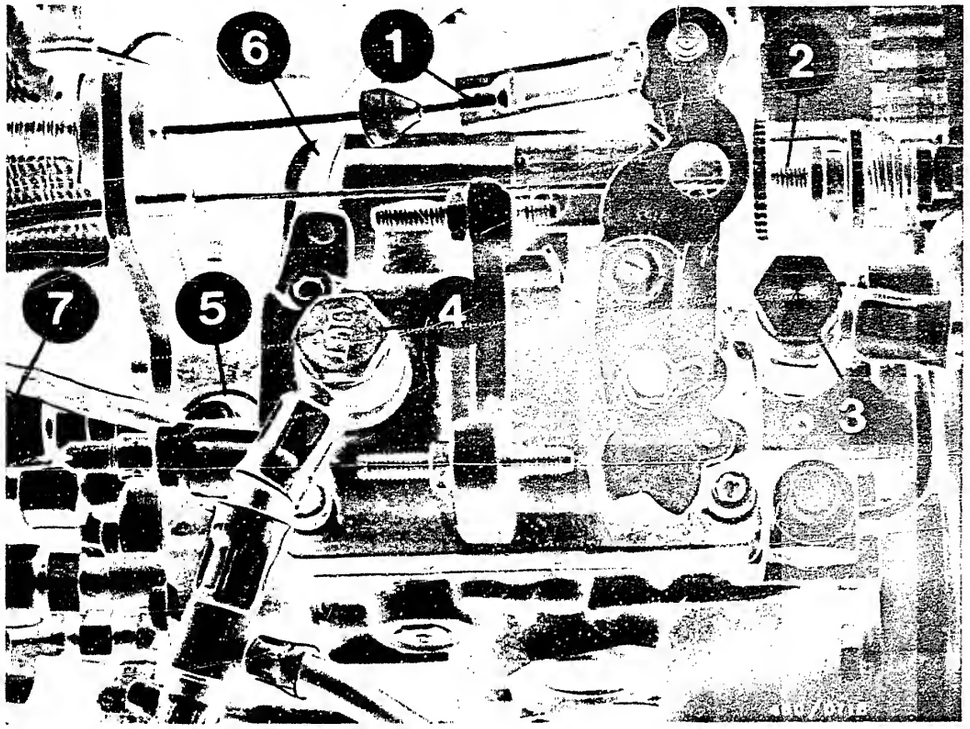


Insert holding device KDEP 1147 between camshaft gear and injection-pump gear (see illustration).

Loosen fastening nut of injection-pump gear (arrow) and screw on by approx. 2 turns.

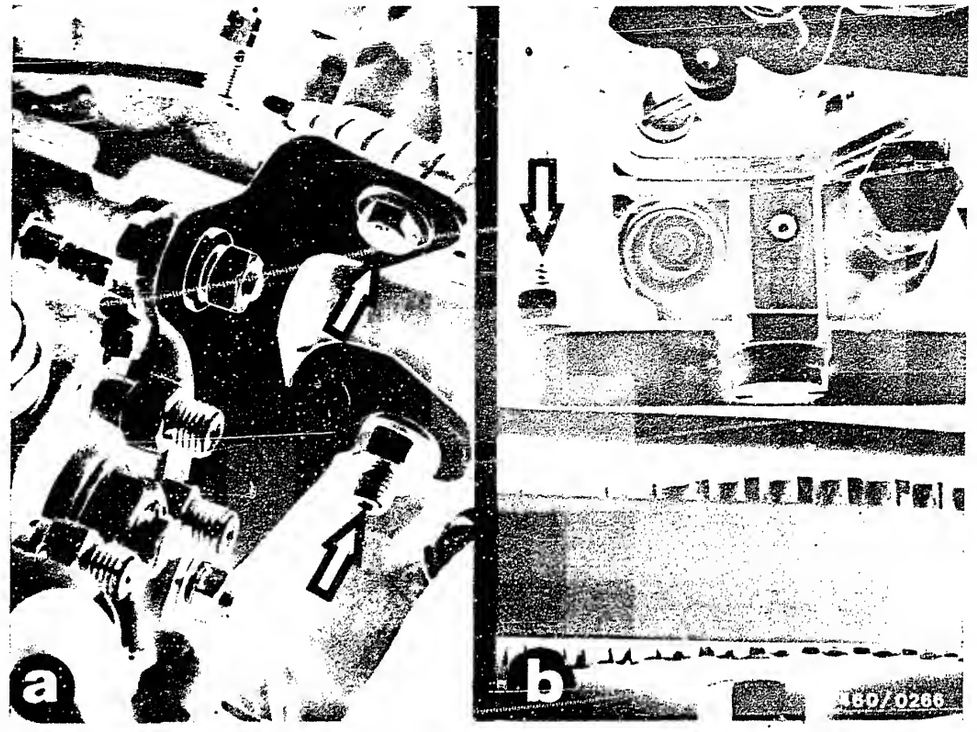
Loosen injection-pump gear using puller KDEP 1118.

Remove fastening screw and plain washer from drive shaft of injection pump.



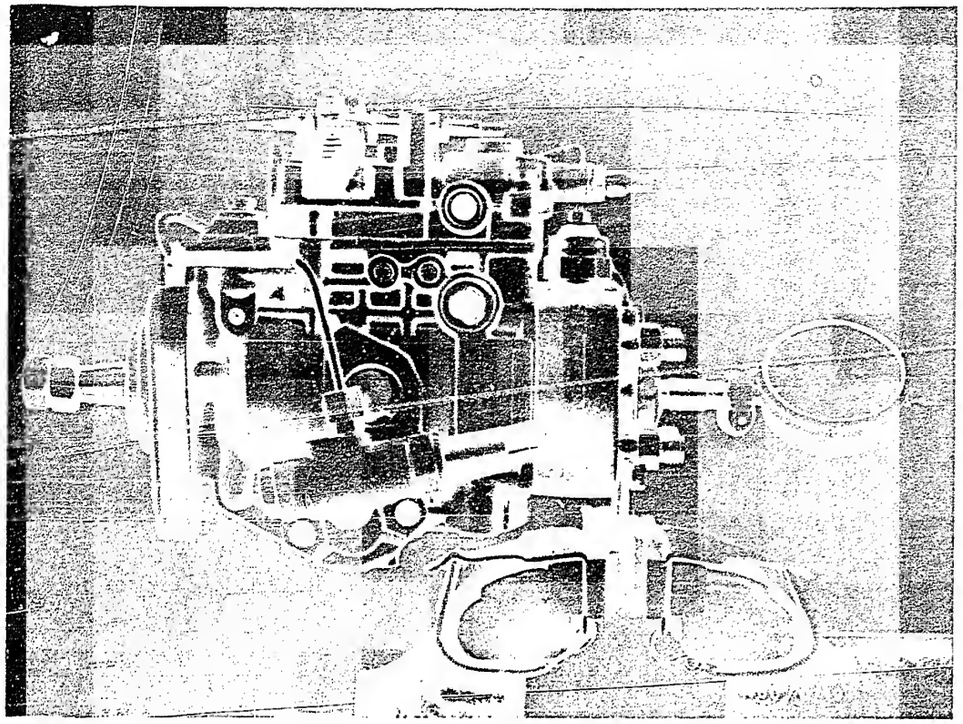
1 = Bowden cable at control lever
2 = Bowden cable, fast idle
3 = Fuel inlet line
4 = Fuel return line
5 = Connecting cable to electric shutoff device
6 = Connecting cable to cold-start accelerator
7 = Fuel-injection tubing

Remove cable at control lever of injection pump, cable for fast idle, fuel lines, electric-shutoff-device connecting cable, cold-start accelerator connecting cable and fuel-injection tubing. (Prevent the delivery-valve holder from loosening by counterholding).



Unscrew fastening screws of injection-pump angle bracket (arrows, illustration a).

Remove fastening nuts of injection pump at pump flange and remove injection pump (arrows, illustration b).



6. INSTALLING INJECTION PUMP

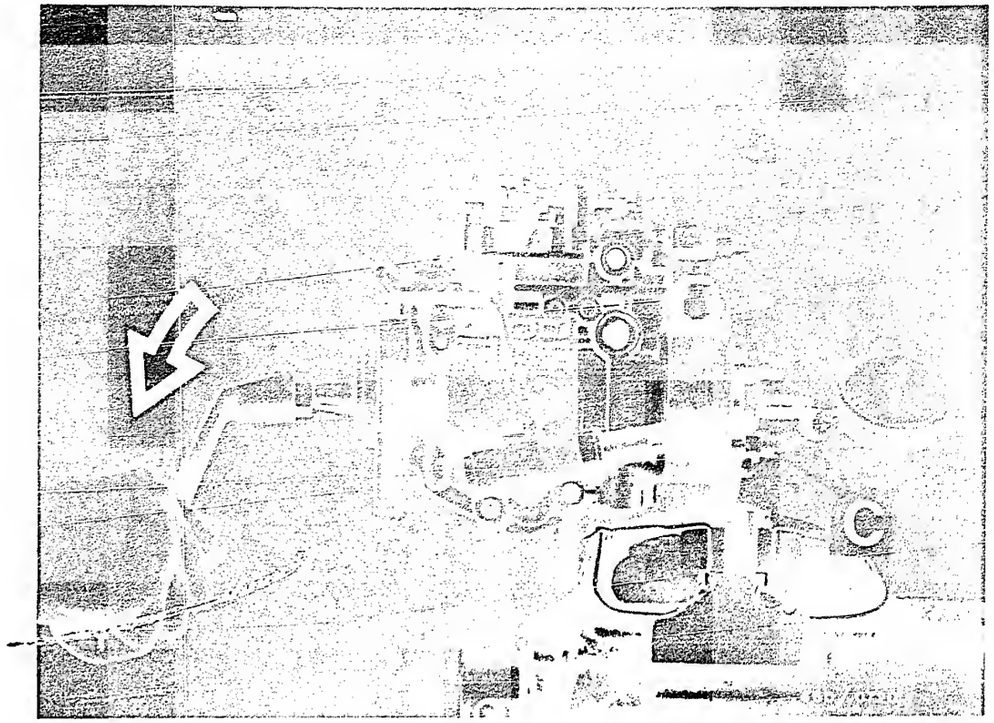
Clamp injection pump in vise (see illustration)

Screw two hexagon nuts onto drive shaft of injection pump and lock.

Remove bleeder screw of injection pump.

Mount measuring tool KDEP 1085 in tapped hole of bleeder screw.

Mount dial indicator 1 687 233 011 with measuring foot into measuring tool KDEP 1085 (see illustration).



Turn pump shaft in direction of arrow until BDC of distributor-pump plunger is obtained.

In this position, pre-load dial indicator approx. 3 mm and set to "0".

Turn drive shaft further in direction of arrow until the keyway (again at BDC position of distributor-pump plunger) points to outlet "C" (see illustration) of distributor head.

Unscrew hexagon nuts (do not turn drive shaft further).

Insert Woodruff key into slot of drive shaft.

Guide injection pump into bore of pump drive gear.

Screw on fastening nuts of injection pump by hand.

Mount washer and fastening nut of pump drive gear and tighten to 50 Nm.

Remove holding device KDEP 1147.

Turn crankshaft two revolutions in direction of engine.

At TDC of cylinder 1, lock crankshaft using setting mandrel KDEP 1123.

In this position, dial indicator at injection pump must indicate a plunger lift of 0.65 mm after BDC.

If necessary, correct by pivoting the injection pump.

Note:

Poor tensioning of the toothed belt adversely affects the pump setting.

Test toothed-belt tension using belt-tension test tool KDEP 1121.

Turn vernier sleeve until the lower edge of the sleeve is aligned with the marking on the measuring tongue.

Read off measurement.

Setting: Scale interval 13...14

Checking the setting

Remove setting mandrel KDEP 1123.

Turn crankshaft 1 3/4 turns in direction of rotation.

Check whether dial indicator is at "0" at BDC of distributor-pump plunger.

Turn crankshaft further until TDC (engine) and lock using setting mandrel KDEP 1123.

Dial indicator at injection pump must indicate a plunger lift of 0.63...0.67 mm.

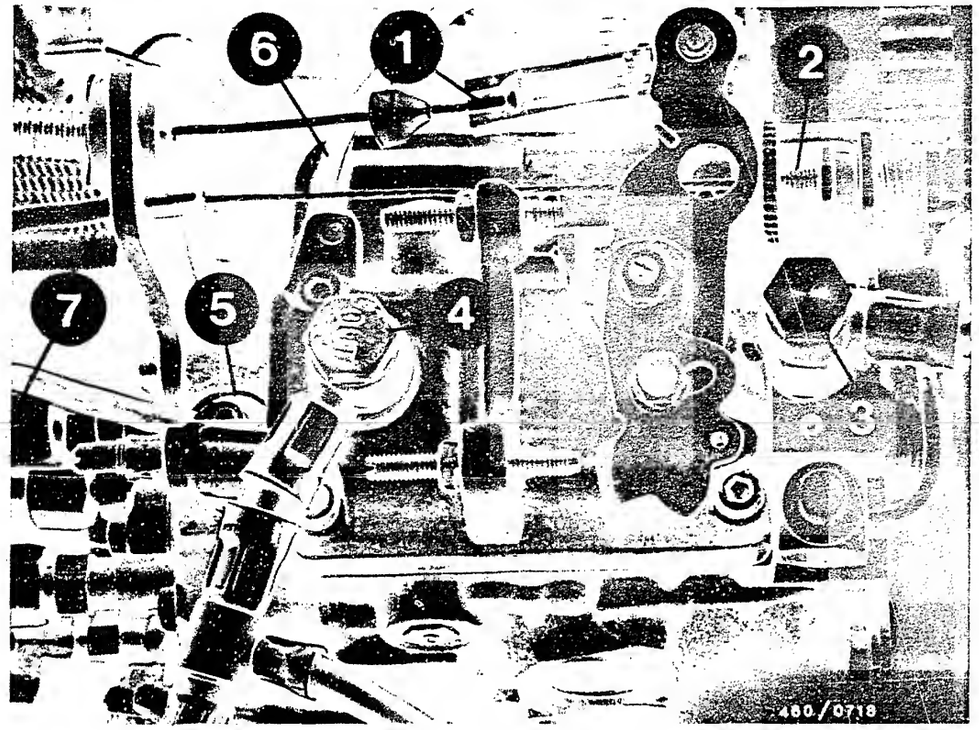
Remove setting mandrel KDEP 1123.

Tighten fastening nuts of injection pump to 25 Nm.

Remove measuring tool KDEP 1085 with dial indicator and mount bleeder screw with new copper sealing ring.

Mount angle bracket at distributor head of injection pump and tighten fastening screws.

Fit toothed-belt protective cover and fuel filter.



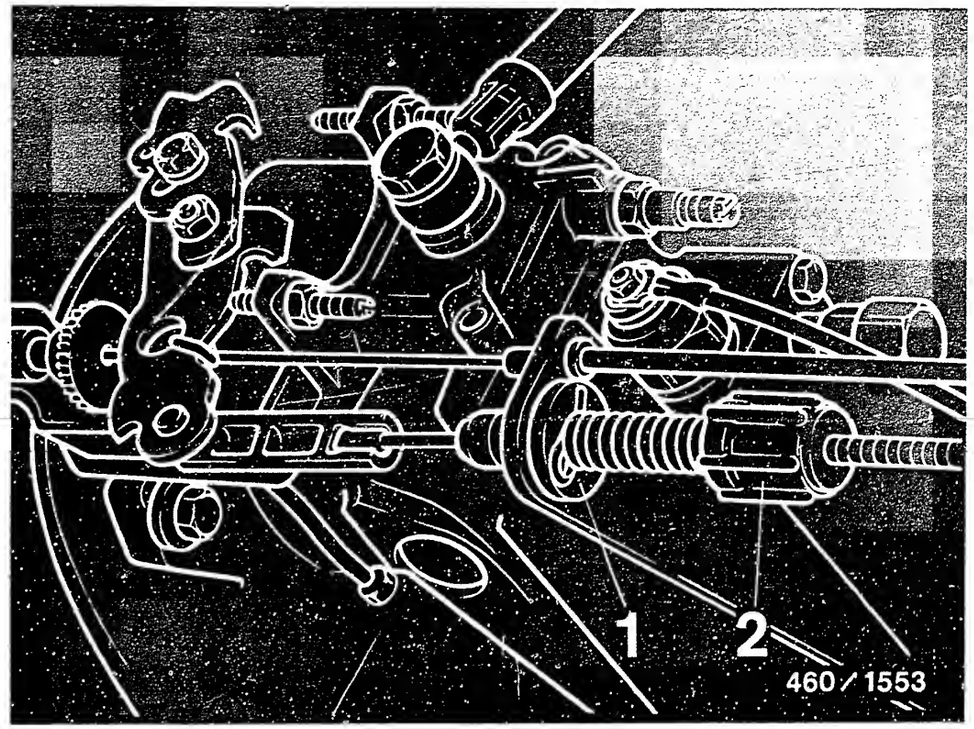
1 = Bowden cable at control lever
2 = Bowden cable, fast idle
3 = Fuel inlet line
4 = Fuel return line
5 = Connecting cable to electric shutoff device
6 = Connecting cable to cold-start accelerator
7 = Fuel-injection tubing

Mount cable at control lever of injection pump, cable for fast idle, fuel lines, electric-shutoff-device connecting cable, cold-start device connecting cable and fuel-injection tubing. (Prevent the delivery-valve holder from turning by counterholding).

Disconnect negative cable from battery.

Note:

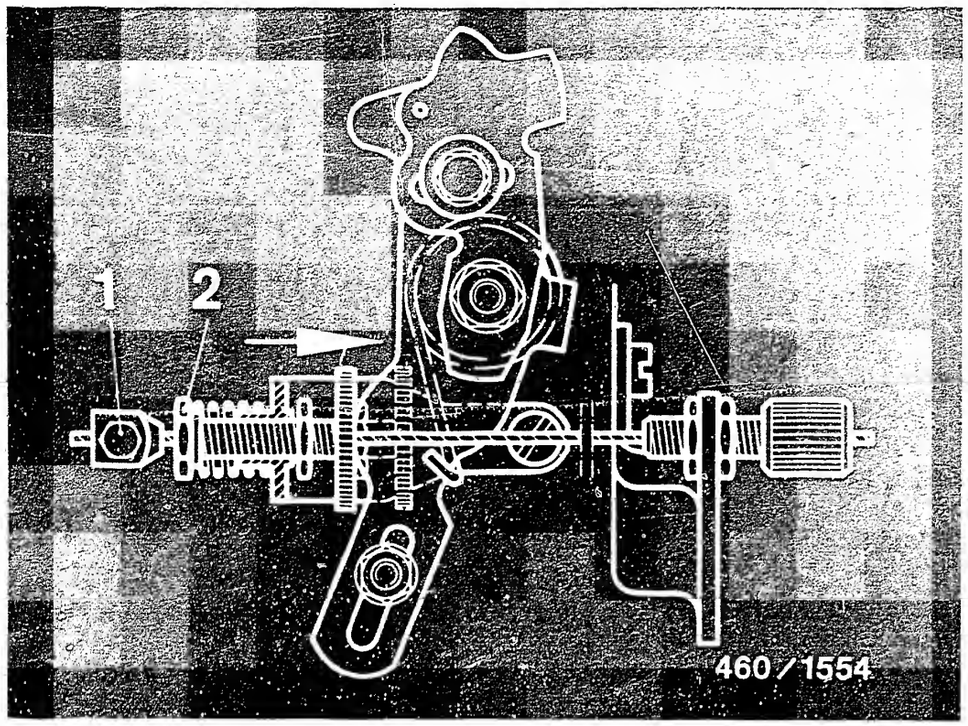
The hollow screw of the fuel return line is equipped with a restriction bore and marked "Out".



1. Fastening clamp
2. Compensating element

Note on throttle-cable adjustment:

Adjust fastening clamp in such a way that the compensating element is pinched by approx. 2 mm.



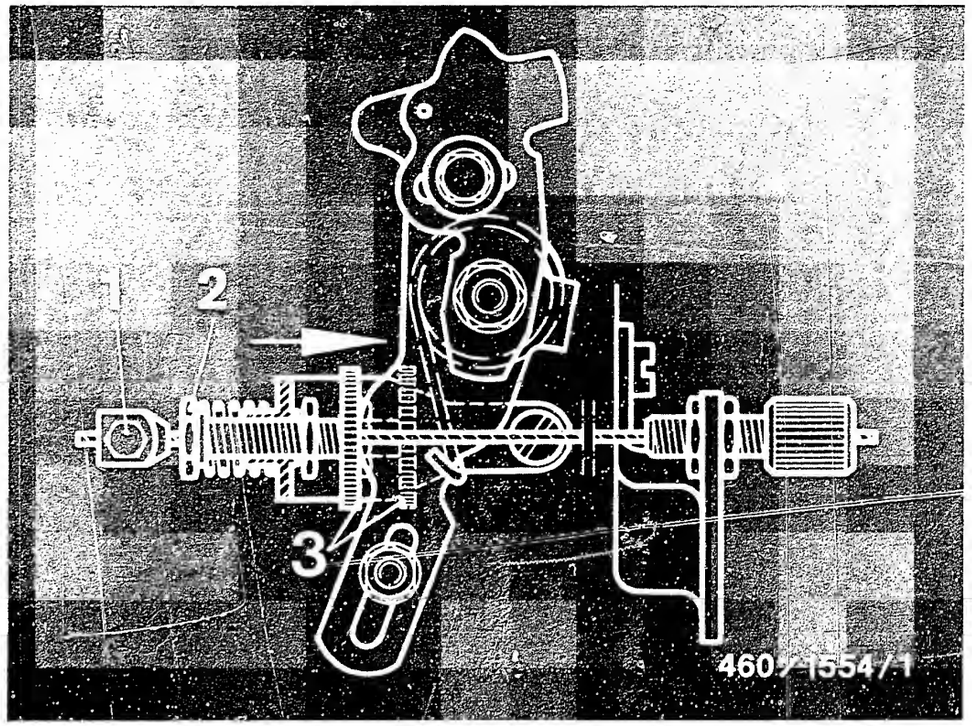
1. Clamping piece
2. Hexagon nut

Adjustment of fast idle:

Engine cold (coolant temperature below 30°C).

Press hexagon nut against spring resistance up to stroke end (direction of arrow).

Tension bowden cable, position clamping piece against hexagon nut and tighten.



1. Clamping piece
2. Hexagon nut
3. Knurled thumb screw

Adjustment of fast idle:

Engine warm (coolant temperature approx. 80°C).

Clearance between clamping piece and hexagon nut 0.5...1.5 mm.

Run engine at idle speed.

Actuate idle increase.

Set value: 1100...1200 min $^{-1}$

Correction is necessary, adjust speed by turning the knurled thumb screw.



7. TESTING AND ADJUSTING ENGINE TIMING

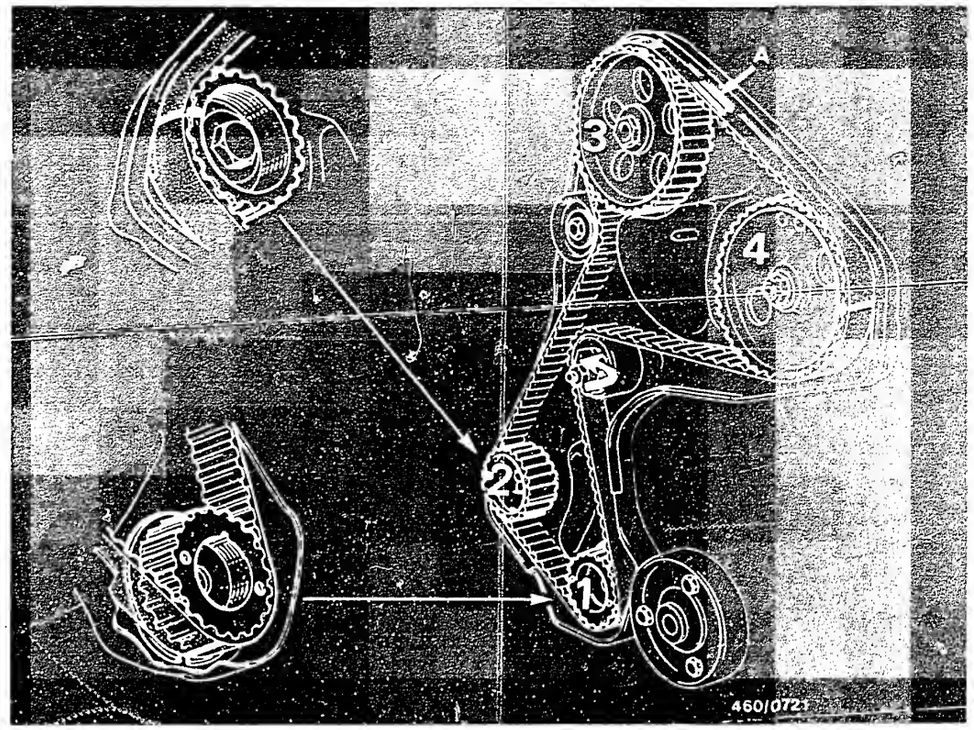
7.1 TESTING ENGINE TIMING

Remove cylinder-head cover and toothed-belt protective cover.

4. Shift into gear and chock up left-hand front wheel.

By turning the front wheel, turn the crankshaft to TDC of cylinder 1 (cylinder 4 at valve overlap) and lock using setting mandrel KDEP 1123.

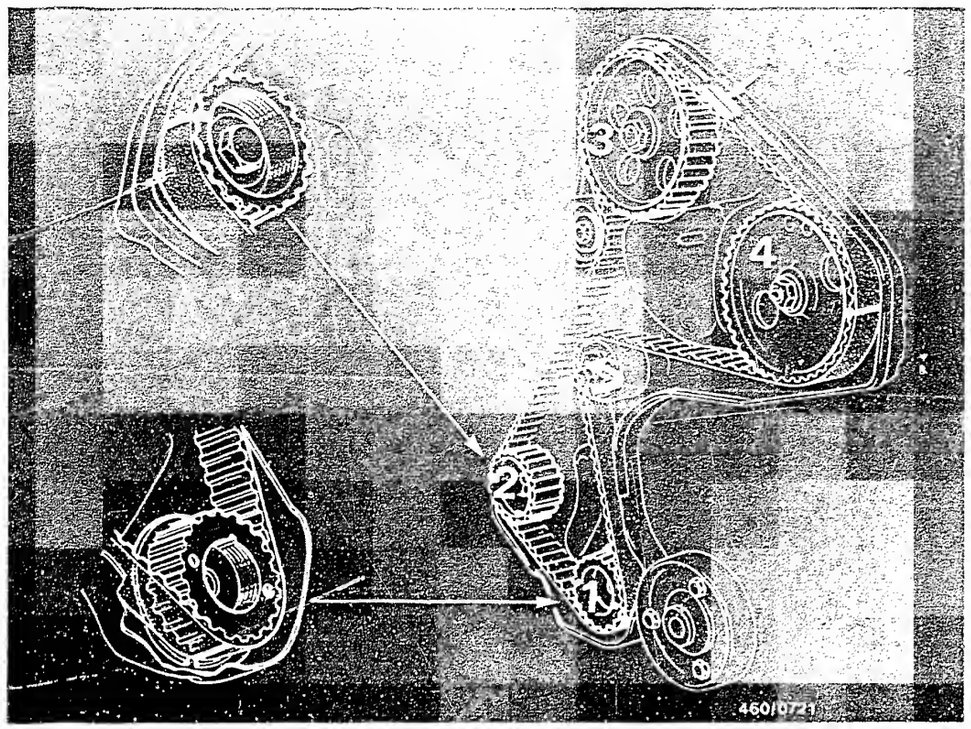
Remove V-belt from generator and pulley of crankshaft.



Check number of teeth of toothed belt between the markings of the toothed gears:

18 teeth between toothed gears 1 and 2
47 teeth between toothed gears 2 and 3
29 teeth between toothed gears 3 and 4

If these numbers of teeth are not obtained, the engine timing must be adjusted accordingly.



7.2 ADJUSTING ENGINE TIMING

Loosen toothed-belt tensioning roller and remove toothed belt.

Test whether setting mandrel KDEP 1123 is locking crankshaft at TDC of cylinder 1.

Align markings of toothed belt and timing gears.

Position toothed belt on timing gears in following sequence: 1 – 2 – 3 – 4..

Remove setting mandrel KDEP 1123.

Note:

Arrow markings on toothed belt (arrow A) indicate direction of assembly and must be positioned between camshaft gear and injection-pump gear.

Set toothed belt to scale interval 13...14 (in accordance with belt-tension tester KDEP 1121) by turning the tensioning roller counterclockwise.

Tighten fastening nut of tensioning roller to 40 Nm.

Turn crankshaft of engine two revolutions.

Lock crankshaft at TDC of cylinder 1 using setting mandrel KDEP 1123.

Check toothed-belt tension and number of teeth of toothed belt between the markings of the toothed gears once again.

18 teeth between toothed gears 1 and 2
47 teeth between toothed gears 2 and 3
29 teeth between toothed gears 3 and 4

Remove setting mandrel.

Tighten pulley of crankshaft to 100 Nm.

Position V-belt of generator and tension.

Mount cylinder-head cover and toothed-belt protective cover.

Test coordination, pump – engine (injection timing):

Testing/adjusting "static"

Engine position:	Cyl. 1 at TDC
Setting value:	
Pump position:	0.63...0.67 after BDC
Check value:	
Pump position:	0.65 after BDC

Testing "dynamic"

Engine speed	825...875 min^{-1}
Start of injection	10.5...12.5° before TDC

T A B L E O F C O N T E N T S

Trouble-shooting instructions : VOL-5000

BOSCH system : K-JETRONIC

Make of vehicle : VOLVO

Basic microcard : VOL-03/J1

Test instructions	Coordinates
Special features	K02
Self-diagnosis / Rapid diagnosis chart	
Test specifications	K03-K07
Electrical terminal diagram	K09-K12
Electrical wiring diagram	
Hydraulic-lines diagram	
Diagram of air / fuel lines	K13-K14
Tools and test equipment	
Testing and adjustment instructions	
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Tests without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* These instructions contain the K-Jetronic trouble-shooting instructions, valid at the time of publication, for the following Volvo model::

  VOLVO 760 GLE
  Engine B28 E, 2.8 l / 6 cylinder 04.84->

* In-tank pre-supply pump

* Downdraught mixture-control unit

* Warm-up regulator with intake-manifold-pressure-controlled full-load enrichment

* Low-idle-speed control

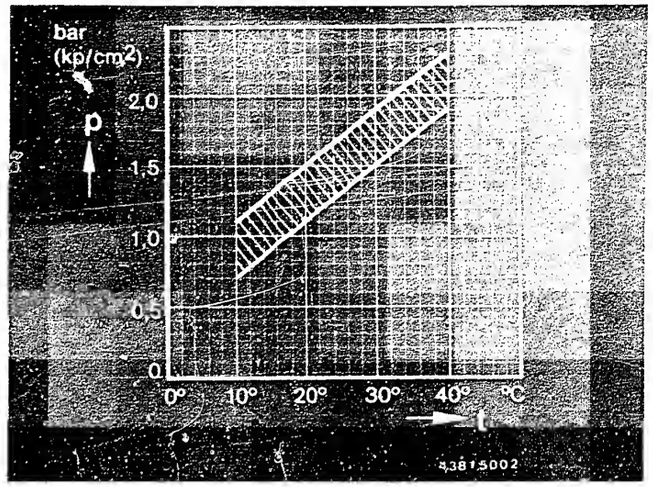
* Vehicle versions for Sweden, Switzerland and Australia are equipped with exhaust-gas recirculation and secondary-air induction ("Puls-air" system).

Important note:

If reference is made to a basic microcard, always make certain that the test specifications are taken from the vehicle-related brief instructions.

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification
1	Electric fuel pump delivery: Supply voltage (under load):	at least 1700 cm ^{3} /min at least 11,5 V
2	Fuel delivery, control-pressure circuit:	160...240 cm ^{3} /min.
3	Fuel distributor primary pressure: Test specification: Setting:	 4,7...5,4 bar 4,9...5,1 bar
4	Control pressure: Take control pressure "cold" from chart opposite in accordance with the ambient temperature measured. To test, connect vacuum pump at intake-manifold pressure connection of warm-up regulator. Setting : 500...550 mbar Control pressure "warm". Test at atmospheric pressure (without vacuum). Test specification: Test with intake-manifold vacuum. Connect vacuum pump at intake-manifold conn. of warm-up regulator. Setting: 500...550 mbar Test specification: Leakage test of full-load diaphragm. Maximum pressure drop from setting value:	 3,0...3,4 bar 3,4...3,8 bar 100 mbar/15s
5	Leakage test, total system: Minimum pressure after 10 mins.: Minimum pressure after 20 mins.:	 2,7 bar 2,6 bar
6	Injection valves, opening pressure: Leakage test not below 2.8 bar: no drop may drip within 25s.	3,0...4,1 bar



p = Contr. press. (overpress.)
t = Ambient temperature

TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification	
7	Fuel deliveries, comparative measurement:	Setting - point: (cm^3/min)	Max. permis. flow: (cm^3/min)
	Idle:	6,0	6,6
	Part load:	40,0	43,0
	Full load:	145,0	160,0
	Min. del. at max. air-flow sensor plate deflection:	145 cm^3/min	
8	Thermo-time switch resistance measurement:	below + 30° C	above + 40° C
	Terminal G and ground:	25...40 Ω	50... 80 Ω
	Terminal W and ground:	0 Ω	100...160 Ω
	Terminal G and terminal W:	25...40 Ω	50... 80 Ω
9	Idle-speed adjustment: *		
	Idle speed (controlled):	approx. 900 min^{-1}	
	Adjustment of idle speed: connect pin 10 of idle-speed regulator (control unit) to ground.		
	On-off ratio:	approx. 26 %	
	Basic idle speed:	approx. 850 min^{-1}	
	Adjust basic idle speed by turning the throttle-valve adjusting screw.		
	On-off ratios:		
	At least:	approx. 26 %	
	At idle speed (controlled):	approx. 30 %	
	Maximum "warm":	approx. 70 %	
	Maximal "cold":	approx. 90 %	
	CO concentration, test value: **	1,0...3,0 % CO by vol.	
	CO concentration, setting:	2,0 % CO by vol.	

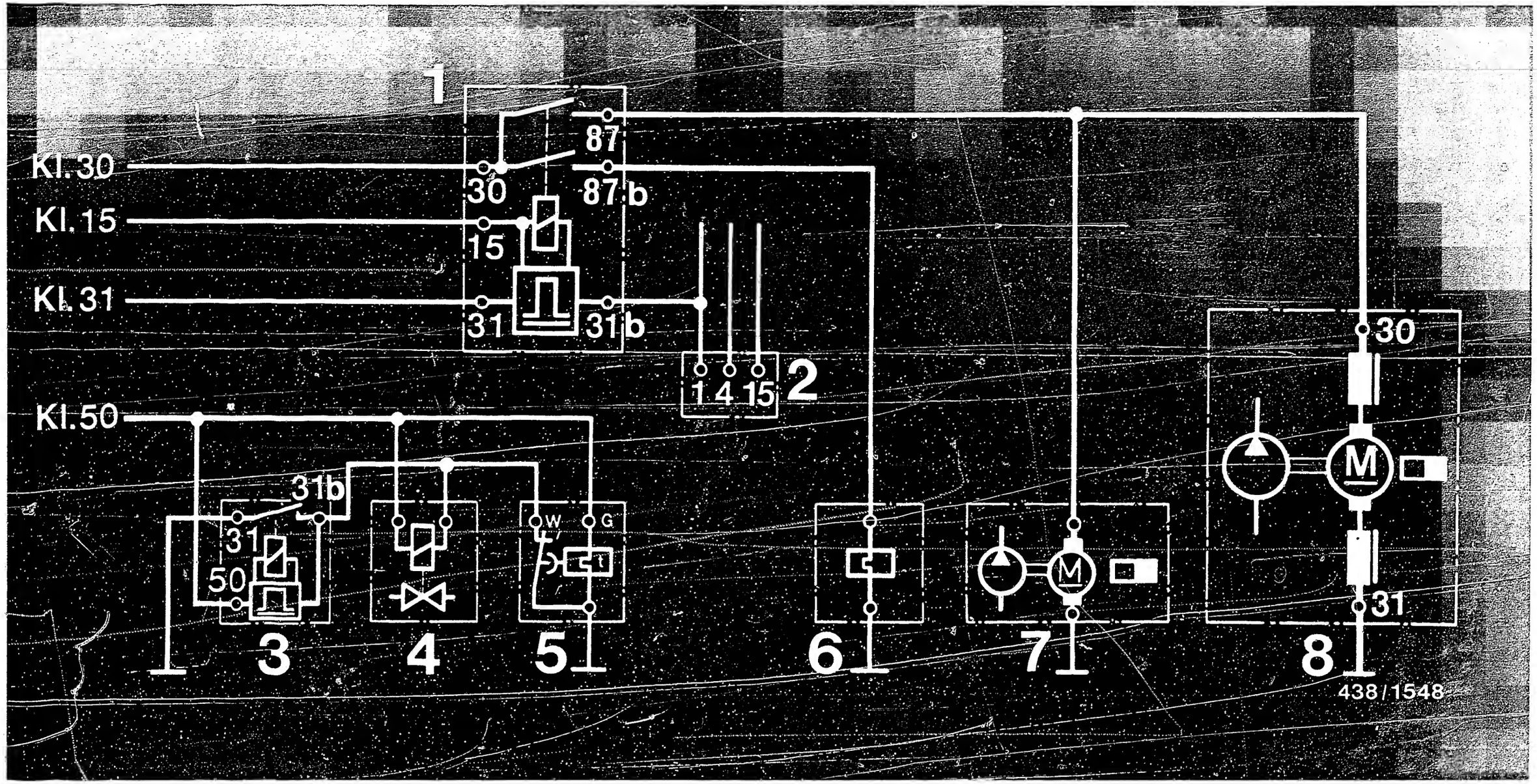
*, **: See next coordinate.

* Notes on idle-speed adjustment:

Engine oil temperature approx. +80°C.
Vehicle versions for Sweden, Switzerland and Australia are equipped with "Puls-air" system. This must be switched off when testing and adjusting the idle speed.
To do this, disconnect hose between Pulsair valve and air filter at air filter and seal tightly with plug.

** Engines whose CO value is within the testing tolerances do not need to be adjusted if otherwise running smoothly.
If the CO value is outside the testing tolerances, adjust to the setting value.

For production reasons:
continued on the following coordinate.

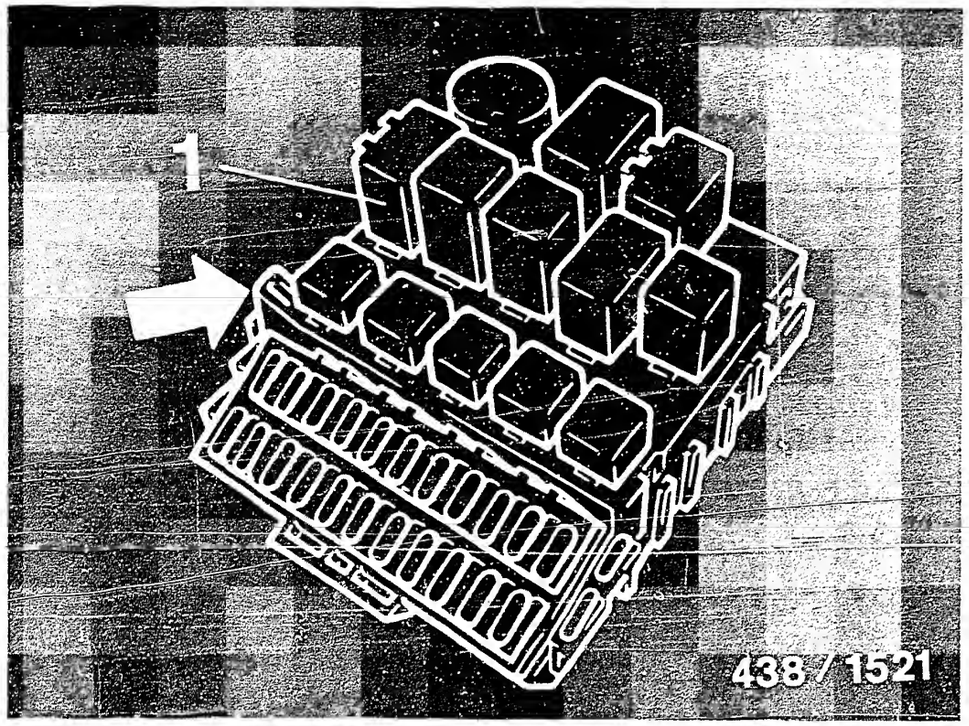


1 = Electronic speed relay
2 = Ignition coil
3 = Pulse relay
4 = Cold-start valve
5 = Thermo-time switch
6 = Warm-up regulator
7 = Fuel pre-supply pump
8 = Electric fuel pump

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT

K09 —— ⟹

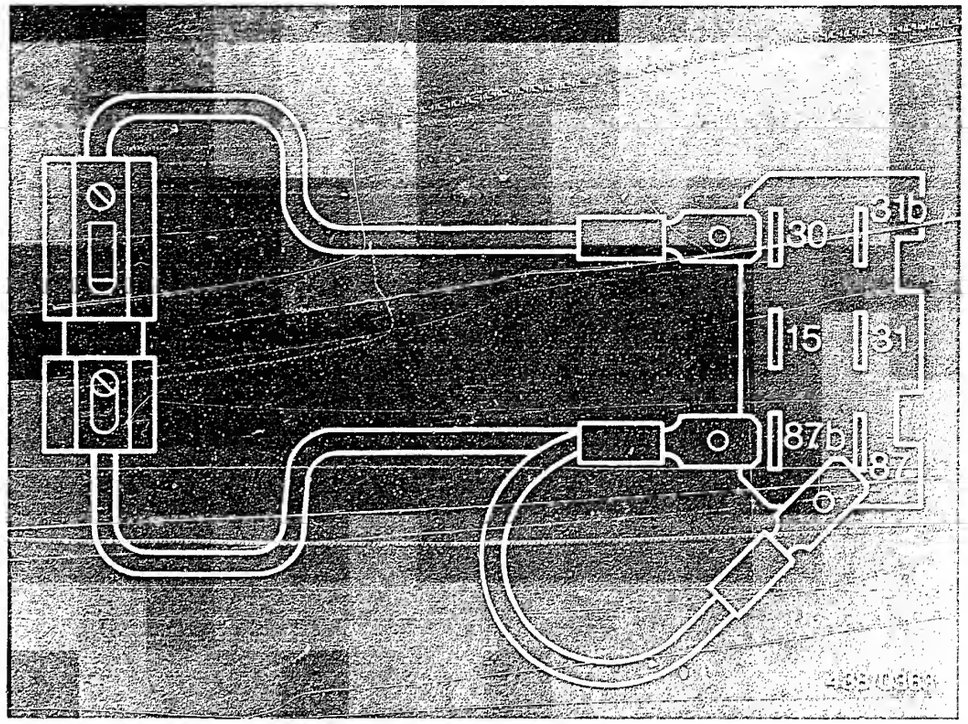
K10 —— ⟺



1 = Electronic speed relay

Bridging the safety circuit:

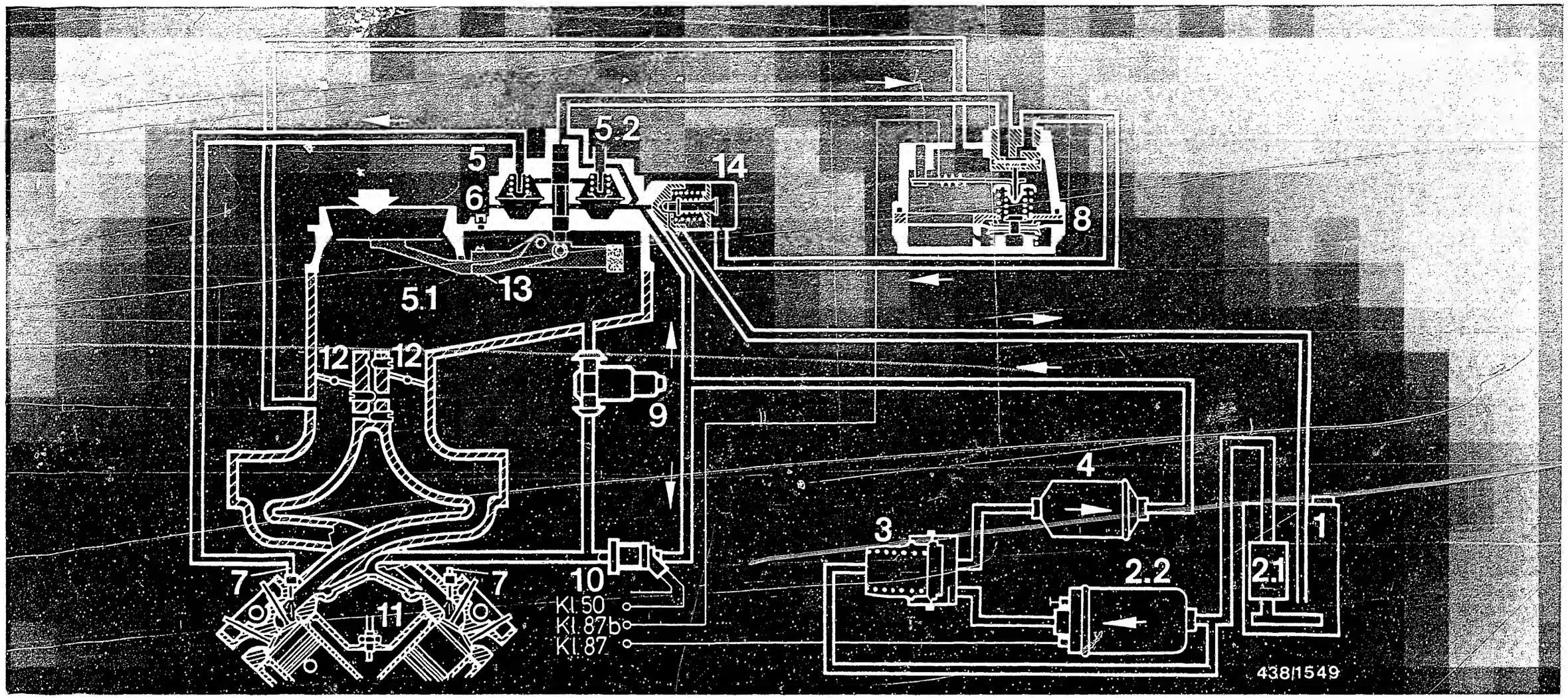
The electronic speed relay is positioned in the console of the central electrics.
Access is gained after the ashtray in the center console is removed.
The console along with the safety component can be removed from the center console by pushing latches positioned at the sides (arrow).



Pull electronic speed relay out of frame.
Using a double bridge, connect contacts 87 and 87b to contact 30 in the frame. Use 1.5 mm² connecting lead with safety element and 16A fuse.

In this way, the electric fuel pump, pre-supply pump and warm-up regulator are supplied with battery voltage.

CAUTION!
Never deflect (push down) the air-flow sensor plate when the electric fuel pump is running, since fuel is then injected via the injection valves.
Actuation of the starting motor may then lead to most serious damage to the engine.



1 = Fuel tank
2.1 = Pre-supply pump
2.2 = Electric fuel pump
3 = Fuel accumulator
4 = Fuel filter
5 = Mixture-control unit
5.1 = Air-flow sensor
5.2 = Fuel distributor
6 = Fuse cap
7 = Injection valve
8 = Warm-up regulator
9 = Idle actuator
10 = Cold-start valve
11 = Thermo-time switch
12 = Throttle valves
13 = Idle-mixture-adjusting screw
14 = Primary-pressure regulator with push valve

DIAGRAM OF FUEL LINES

K13 —⟹

K14 ⟸—

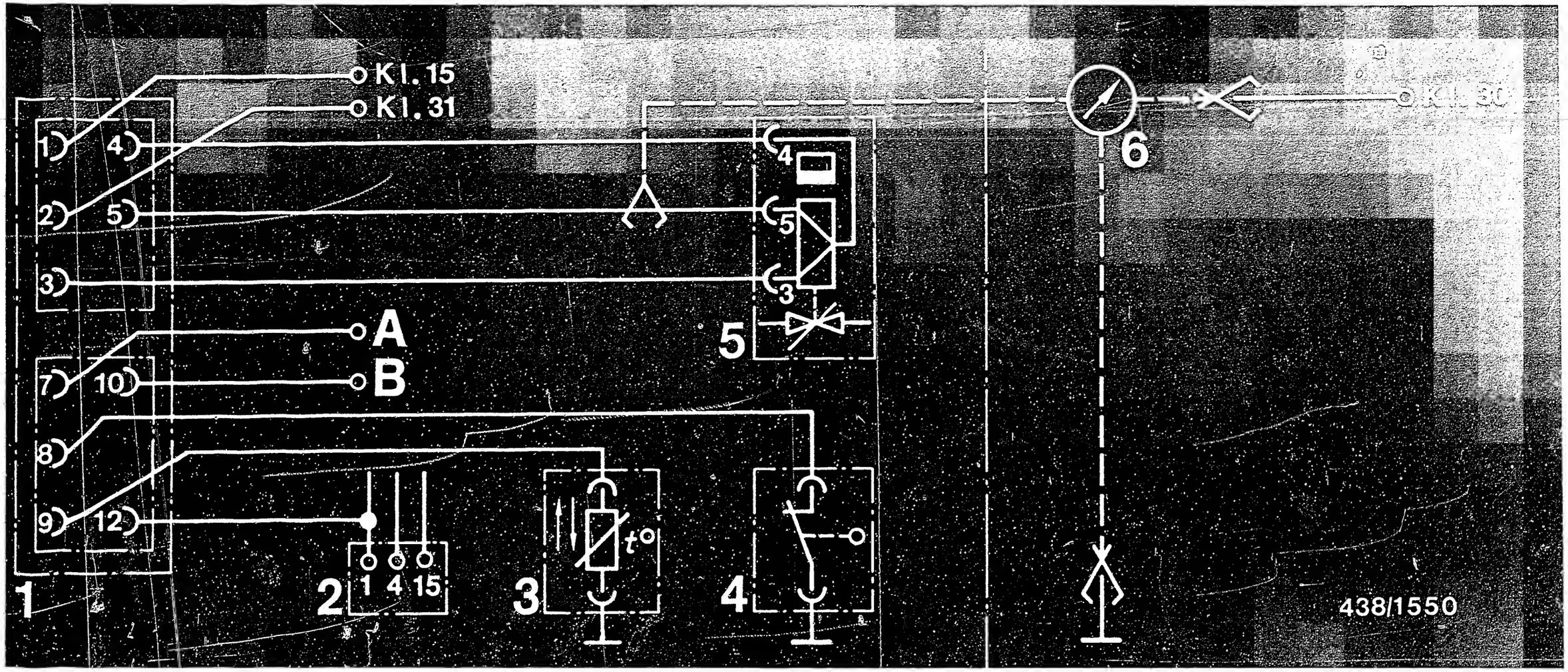
GENERAL IMPORTANT INFORMATION

* Never deflect (push down) the air-flow sensor plate when the electric fuel pump is running, since fuel is injected. Actuation of the starting motor may then lead to most serious damage to the engine.

* Observe the test equipment regulations when testing the injection valves using the valve tester.
  Never test using standard gasoline or other highly inflammable fluids. Even when using white spirit, observe the safety regulations of the workplace.

* Leakage test of the engine intake system only using permissible leakage detection spray (e.g. Gypoflex).
  Do not use highly inflammable fluids.
  Observe the safety regulations of the workplace.

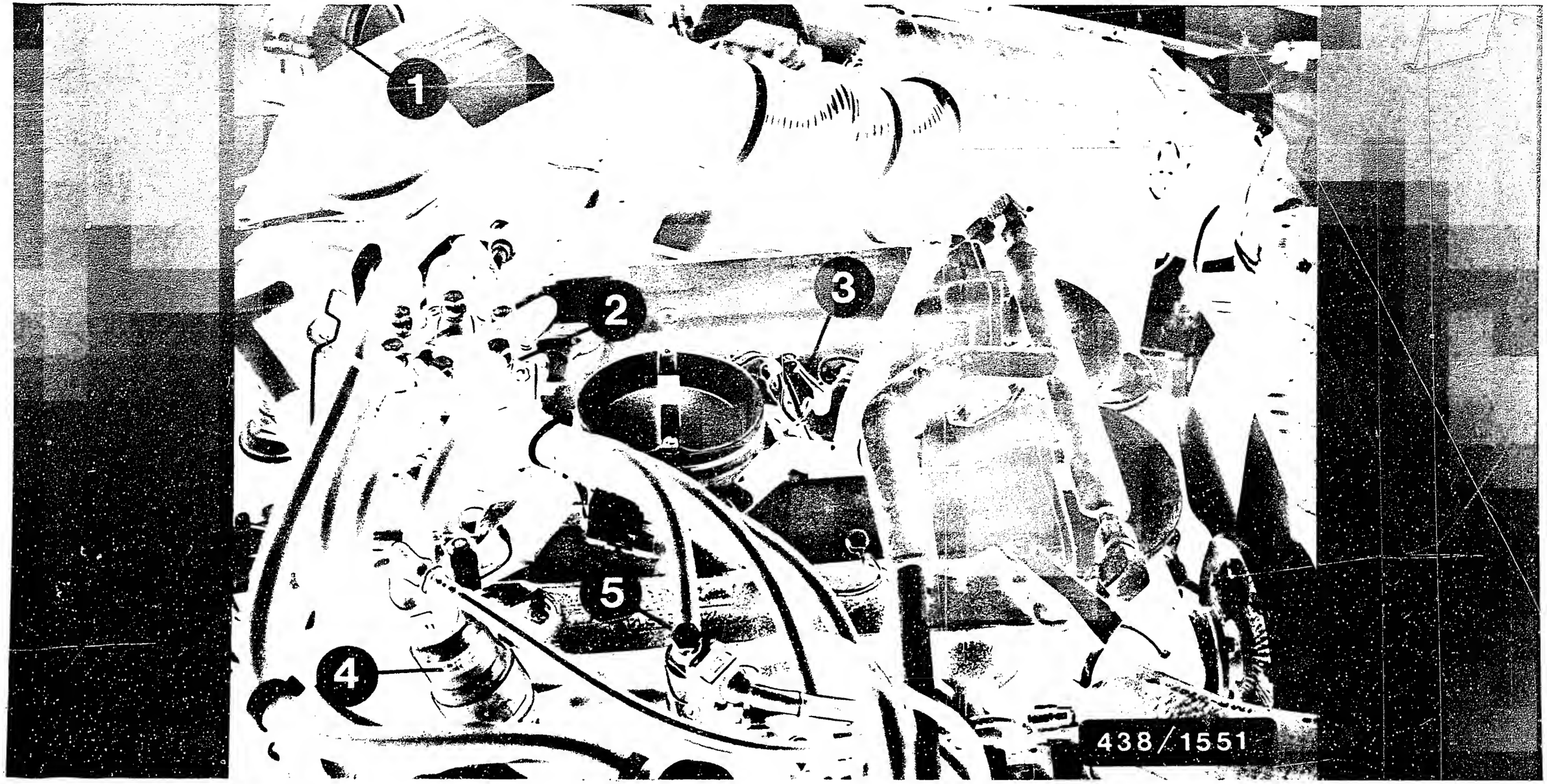
For production reasons:
continued on the following
coordinate.



1 = Idle-speed regulator (control unit)
2 = Ignition coil
3 = Temperature sensor (NTC)
4 = Throttle-valve switch, idle
5 = Idle actuator
6 = Lambda closed-loop control tester
A = Air conditioner
B = Test pin

Low-idle-speed control

The idle speed is controlled via the idle-speed regulator (control unit) and the idle actuator. Instead of an auxiliary-air device, the idle actuator is installed in the air bypass to the throttle valve. To measure the on/off ratios, connect the lambda closed-loop control tester.



1 = Fuel filter
2 = Mixture-control unit
3 = Throttle-valve switch, idle
4 = Idle actuator
5 = Cold-start valve

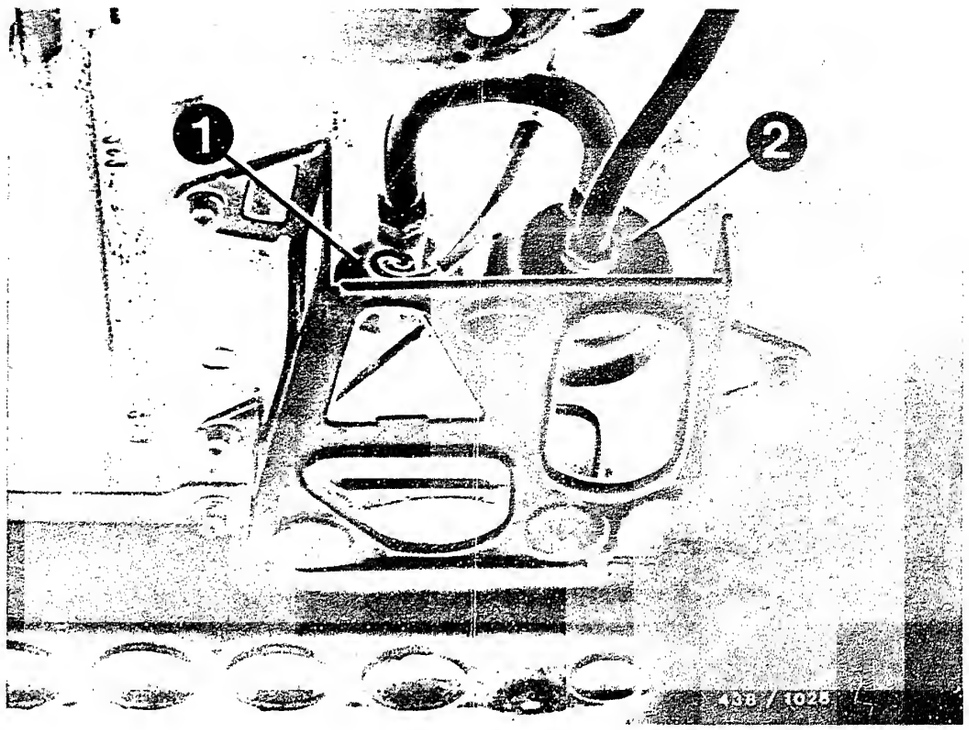
INSTALLATION POSITION OF COMPONENTS

* The injection valves are positioned in the respective locating bores in the cylinder heads, beneath the intake tubes.

* The warm-up regulator is positioned near to the cold-start valve.

* The pulse relay is screwed on at the coolant expansion tank (at left-hand McPherson strut dome).

* The idle-speed regulator (control unit) is installed in the passenger compartment on the left beneath the instrument panel.



1 = Electric fuel pump
2 = Fuel accumulator

* Components of the fuel supply system

The electric fuel pump and fuel accumulator are positioned on a common console beneath the vehicle floor in the area beneath the driver's seat.

T A B L E O F C O N T E N T S

Trouble-shooting instructions : PEU-5000

BOSCH system : LU1-Jetronic

Make of vehicle : PEUGEOT

Basic microcard : PEU-506

Test instructions	Coordinates
Special features	L02
Self-diagnosis / Rapid diagnosis chart	L03-L06
Test specifications	L07-L09
Electrical terminal diagram	L11-L12
Electrical wiring diagram	L13-L14
Hydraulic-lines diagram	
Diagram of air / fuel lines	L15-L16
Tools and test equipment	
Testing and adjustment instructions	
Installation position of components	L18-L22
Notes on removal and installation	
General important information	

Tests without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* This microcard contains the LU1-Jetronic trouble-shooting instructions, valid at the time of publication, for the following Peugeot model:

  PEUGEOT 505i Turbo
  with 2.155 l / 4-cyl. engine
  USA version (05.85->)
  EU version (11.85->)

* LU1-Jetronic with 25-pin control unit 0 280 000 343, 5-pin air-flow sensor, 7-pin control relay, solenoid-operated injection valves with copper-wire coil.
* Auxiliary relay for solenoid-operated injection valves and control unit.
* Pre-supply pump.
* Enrichment signal from control unit of ignition
* Pressure sensor for altitude correction
* Suppression of overrun cut-off through + 60° C temperature switch
* Heated lambda sensor and catalytic converter
* tv coding for USA (Federal) and California
* Intercooler, charge-air-pressure switch
* Fuel-tank ventilation

Important note: If reference is made to a basic microcard, always make certain you use the test specifications from the vehicle-specific brief instructions.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

The following rapid diagnosis chart makes it possible for the experienced L-Jetronic expert to quickly check the electric part of the system using the universal test adapter. The rapid diagnosis chart contains the following details:

* Test step sequence.
* Position of the V- and Ω -program-selector switches.
* Remarks with regard to the operation of the universal test adapter or other components.
* Test specifications for motortester and multimeter.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

Testing the LU1-Jetronic with adapter lead 1 684 463 123

Test step	Switch position V	Switch position Ω	Measurement	Control-unit plug between term.	Remark	Test specifications (reading)
1	5	–	TN signal from EI-K control unit term. 17	1 <==> 5	Shift into neutral, start	Rectangular pulses on oscilloscope
2	6	–	Voltage from auxiliary relay term. 87	9 <==> 5	Switch on ignition.	8... 15 V
3	7	–	Voltage from ignition and starting switch term. 50	4 <==> 5	Shift into neutral, start	8... 15 V
4	8	–	Voltage from altitude sensor term. 11	11 <==> 5	Switch on ignition. At air pressure: 980 mbar (approx. 300 m altitude) 615 mbar (approx. 4000 m altitude)	 2,0... 4,0 V 8,0...12,0 V
5	V	11	Resistance combination in air-flow sensor term. 8	8 <==> 5		150... 400 Ω
6	V	12	Resistance of potentiometer in air-flow sensor term. 7	7 <==> 5	Deflect air-flow sensor flap as far as will go.	60 ...1000 Ω
7	V	13	Resistance of temperature sensor NTC II term. 10 (engine temperature)	10 <==> 5	+15°C...+30°C : +80°C :	1,45...3,3 k Ω 280... 350 Ω
8	V	14	Resistance, ground output stage term. 13	13 <==> 5		0... 10 Ω

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)

Testing the LU1-Jetronic with adapter lead 1 684 463 123

Test step	Switch position V	Switch position Ω	Measurement	Control-unit plug between term.	Remark	Test specifications (reading)
9	V	16	Resistance of idle contact in throttle-valve switch term. 2	2 <==> 9	Disconnect connection plug from ignition control unit. Accelerator pedal in idle pos.	0...10 Ω
					Slightly depress accelerator pedal	infinite Ω
10	V	16	Resistance of charge-air-pressure switch	2 <==> 9	Fully depress accelerator pedal	infinite Ω
					Additionally apply 1.5 bar over-pressure to charge-air-press. sw.	0...10 Ω
11	V	17	Resistance of full-load output of EI-K control unit term. 18	3 <==> 9	Reconnect connection plug to ignition control unit.	1,5...2,5 k Ω
12	V	18	Resistance of all 4 injection valves with series resistors connected in parallel term. 12	12 <==> 9	(+15°C...+30°C): (+80°C) :	5,0...7,5 Ω 5,1...7,75 Ω

R e m a r k : The following components with relevant connection leads are not covered by the universal test adapter in the rapid diagnosis chart:

1. Auxiliary-air device: Leads 26 and 72
2. Cold-start valve: Leads 30 and 4/2
3. Thermo-time switch: Leads 30, 29 and ground
4. Control relay: Leads 59/1, 60, 57
5. Electric fuel pump: Leads 28 and 61
6. Pre-supply pump Leads parallel to 28 and 61
7. Heating of lambda sensor Leads 73 and 74
8. Sensor lead: Leads 20 and shielding
9. Tank ventilation relay: Leads 18, 50, 51, and 52
10. Temperature switch +60°C: Leads 52 and ground
11. tv coding: Leads 19 and 71
12. Tank ventilation valve: Leads 85/2 and 50
13. Enrichment signal Lead 15
14. Diode (overrun cut-off) Lead 18

Pressure regulator
* Fuel pressure: 2,3...2,7 bar

Electric fuel pump
* Fuel delivery at return: at least 750 cm ^{3} /30 s
* Connection voltage under load: at least 12 V

Pre-supply pump
* Fuel delivery: at least 850 cm ^{3} /30s

Temperature sensor NTC II (engine)
* Internal electrical resistance at ambient temperature (+15°C...+30°C): 1,45...3,3 k Ω
with engine at norm. op. temp. (approx. +80°C): 280...360 Ω

Auxiliary-air device
* Internal elec. resistance: 20... 55 Ω

Air-flow sensor
* Resistance value between
term.8 and term.5: 340...450 Ω
term.7 and term.5: (fully deflect air-flow sensor flap) 60...1000 Ω
term.9 and term.5: 500...760 Ω
term.8 and term.9: 160...300 Ω

Solenoid-operated injection valve
* Internal electrical resistance at ambient temperature (+ 15° C...+ 30° C): 2,0...3,0 Ω

Series resistor
* Electrical resistance: 5,0...7,0 Ω

Pressure sensor (altitude sensor)
* 300 m altitude (977 mbar): 2,0... 4,0 V
4000m altitude (616 mbar): 8,0...12,0 V
Resistance between term. 2 (-) and term. 3 (+): 2,3... 2,5 k Ω

Charge-air-pressure switch
* Resistance at atmospheric pressure: infinite Ω
at 1.2...1.5 bar overpressure 0 Ω

Thermo-time switch 35°/8 s

* Internal electrical resist. at	Between term. "G" and ground	Betweenn term. "W" and ground	Between term. "G" and "W"
Ambient temperature (below +30°C)	25...40 Ω	0 Ω	25...40 Ω
Engine at norm. op. temp (above +40°C)	50...80 Ω	100...160 Ω	50...80 Ω

Cold-start valve
* Internal electrical resistance: 3,5...4,5 Ω
* Leakage: maximum permissible: 1 drops/min.

Idle adjustment
* Idle speed
Manually-shifted transmission: 850... 950 min $^{-1}$
Automatic transmission: 900...1000 min $^{-1}$

* CO adjustment via lambda closed-loop control

Closed-loop control mode (sensor connected):
Voltage reading fluctuates between 2 values:

Open-loop control mode (sensor lead disconnected):
Voltage reading must be equal to the mean value of the fluctuations.

TEST SPECIFICATIONS (CONTINUED)

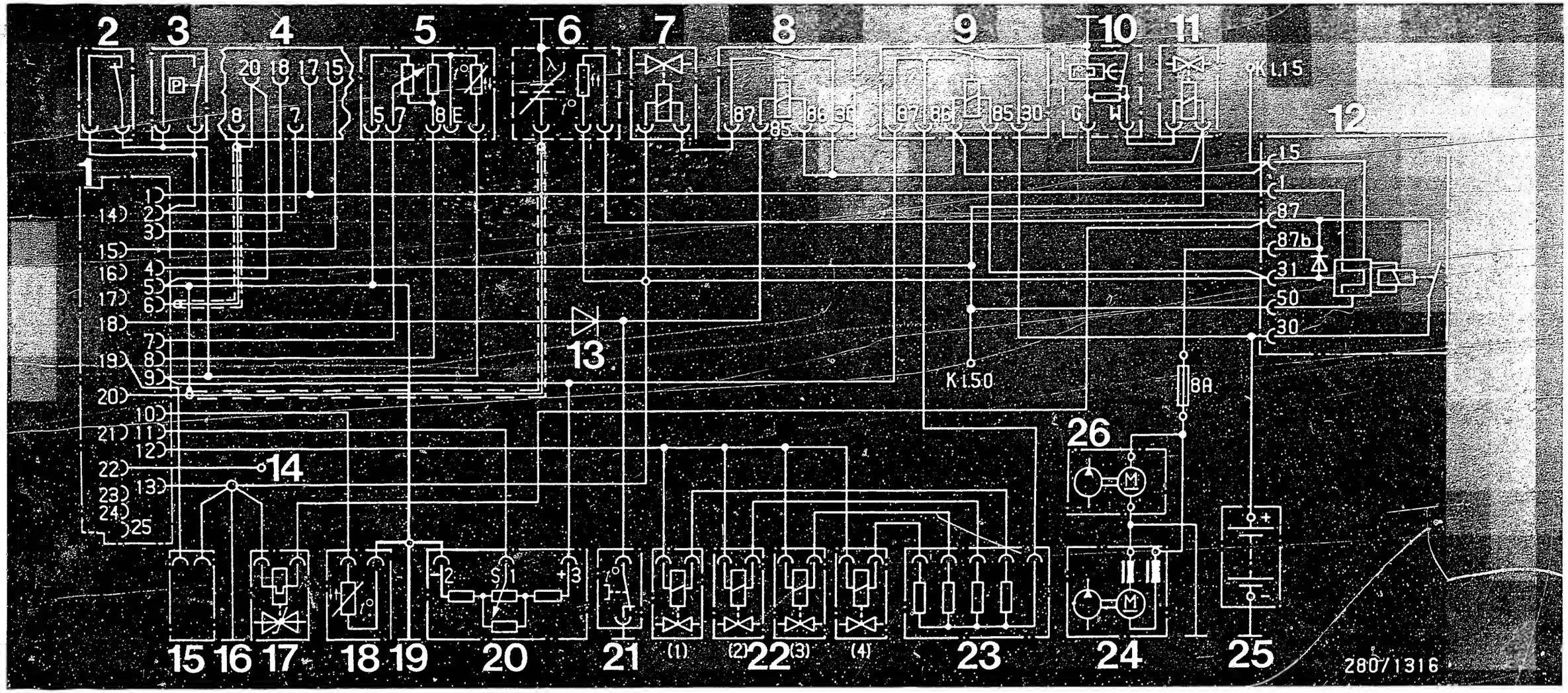
Lambda closed-loop control
* Rich value
  (Disconnect sensor lead and
  apply at control-unit end to
  ground): 9...11 V
* Lean value
  (Apply 2 V to control-unit end
  of sensor lead): approx. 0,5 V

Switch off suction plant for duration of exhaust-gas measurement and setting.

Lambda sensor heater
* Internal electrical
  resistance (PTC): 1,0...15,0 Ω

See equipment and Autodata microcards for settings for ignition, valve clearance and other engine-related data.

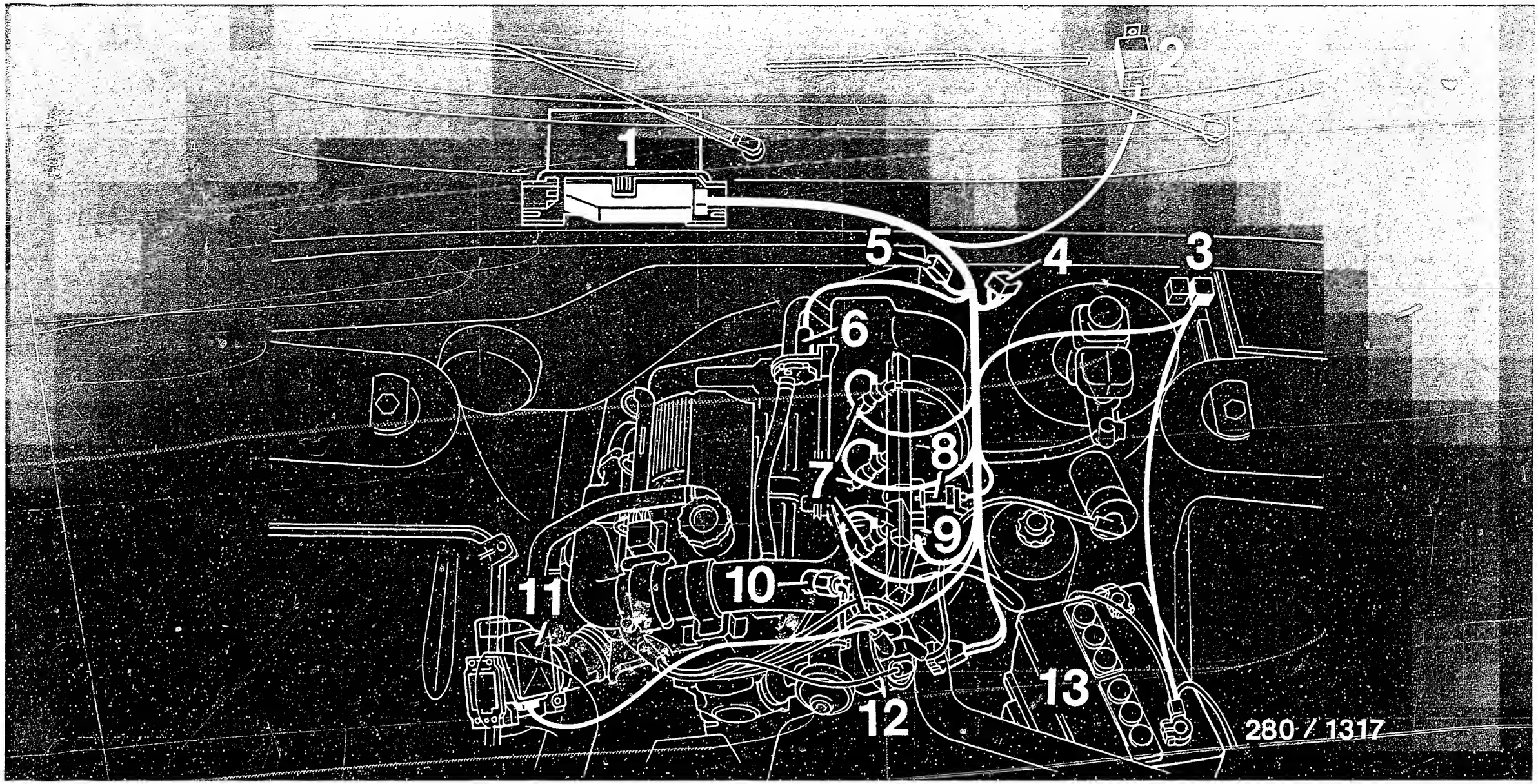
For production reasons:
continued on the following coordinate.



1 = Control-unit plug
2 = Throttle-valve switch (LL)
3 = Charge-air-pressure switch
4 = Control unit of ignition
5 = Air-flow sensor
6 = Heated lambda sensor
7 = Tank ventilation valve
8 = Tank ventilation relay
9 = Auxiliary relay
10 = Thermo-time switch
11 = Cold-start valve
12 = Control relay
13 = Diode (overrun cut-off)
14 = Test pin integrator (lambda)
15 = t_v coding
16 = Ground terminal output stage
17 = Auxiliary-air device
18 = Temperature sensor II (engine temperature)
19 = Ground terminal
20 = Pressure sensor (altitude sensor)
21 = Temperature switch + 60°C
22 = Solenoid-operated injection valves
23 = Series resistors
24 = Electric fuel pump
25 = Battery
26 = Pre-supply pump

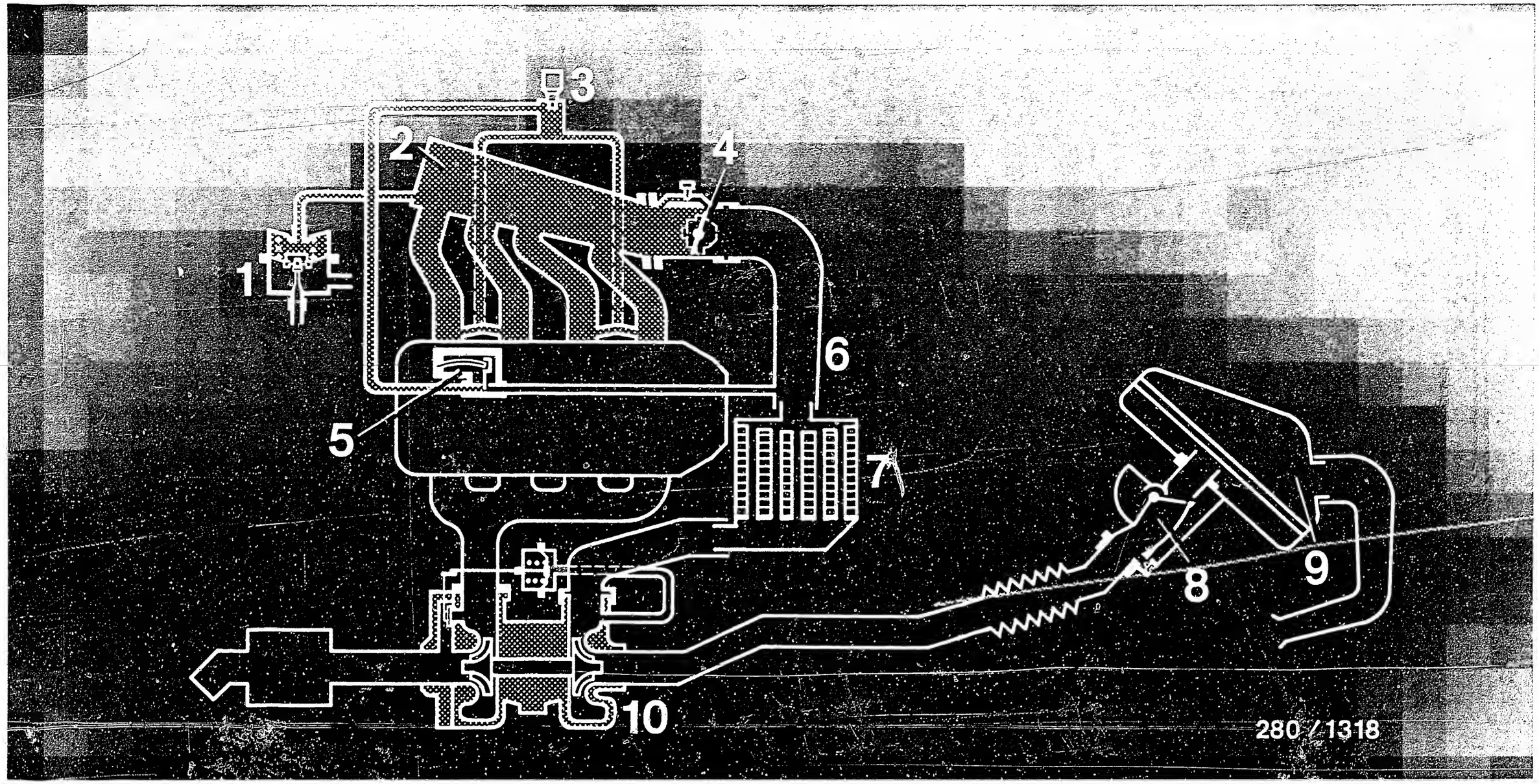
ELECTRICAL TERMINAL DIAGRAM

L11 ⟹
L12 ⟸



1 = Control unit
2 = Control relay
3 = Auxiliary relay
4 = Tank ventilation relay
5 = Series resistors
6 = Auxiliary-air device
7 = Solenoid-operated injection valves
8 = Cold-start valve
9 = Throttle-valve switch
10 = Charge-air-pressure switch
11 = Air-flow sensor
12 = Ignition distributor
13 = Battery

DIAGRAM OF ELECTRICAL WIRING AND ARRANGEMENT OF INDIVIDUAL COMPONENTS



|:::::::| = Intake-manifold pressure

| | = Atmospheric pressure

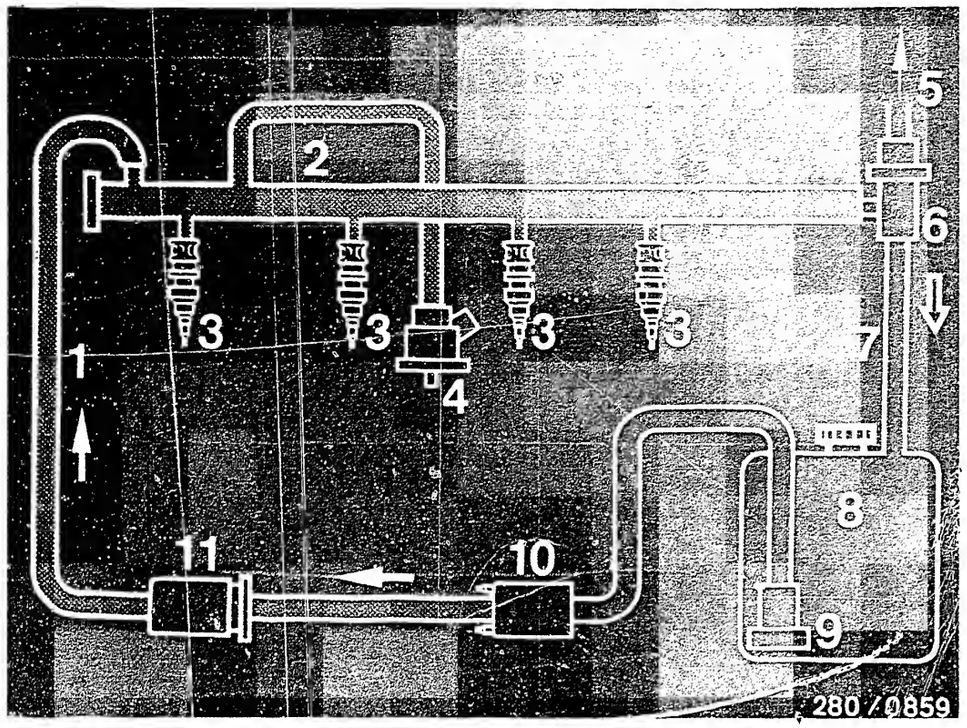
1 = Pressure regulator
2 = Intake manifold
3 = Cold-start valve
4 = Throttle valve
5 = Auxiliary-air device
6 = Air-guide pipe
7 = Intercooler
8 = Air-flow sensor
9 = Air filter
10 = Exhaust turbo-superch.

DIAGRAM OF AIR AND FUEL LINES

Diagram of air lines

L15 ——⟹

L16 ⟸——⟹

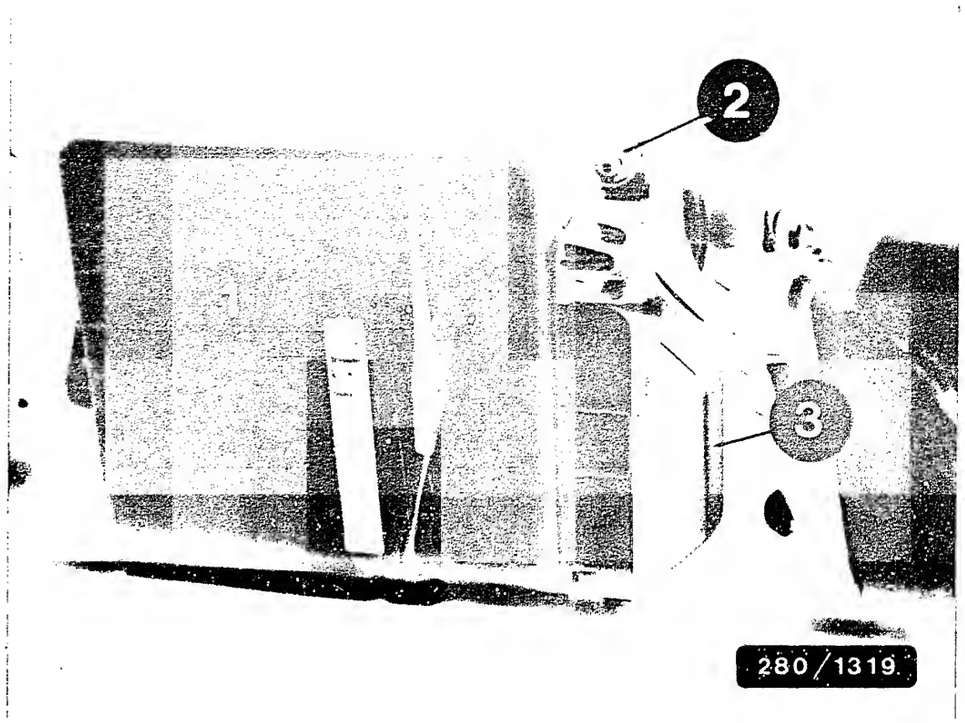


= pressureless

= Fuel pressure

1 = Fuel-pressure line
2 = Fuel-distribution pipe
3 = Solenoid-operated injection valves
4 = Cold-start valve
5 = Intake-manifold pressure connection
6 = Pressure regulator
7 = Fuel return line
8 = Fuel tank
9 = In-tank pre-supply pump
10 = Electric fuel pump
11 = Fuel filter

Diagram of fuel lines



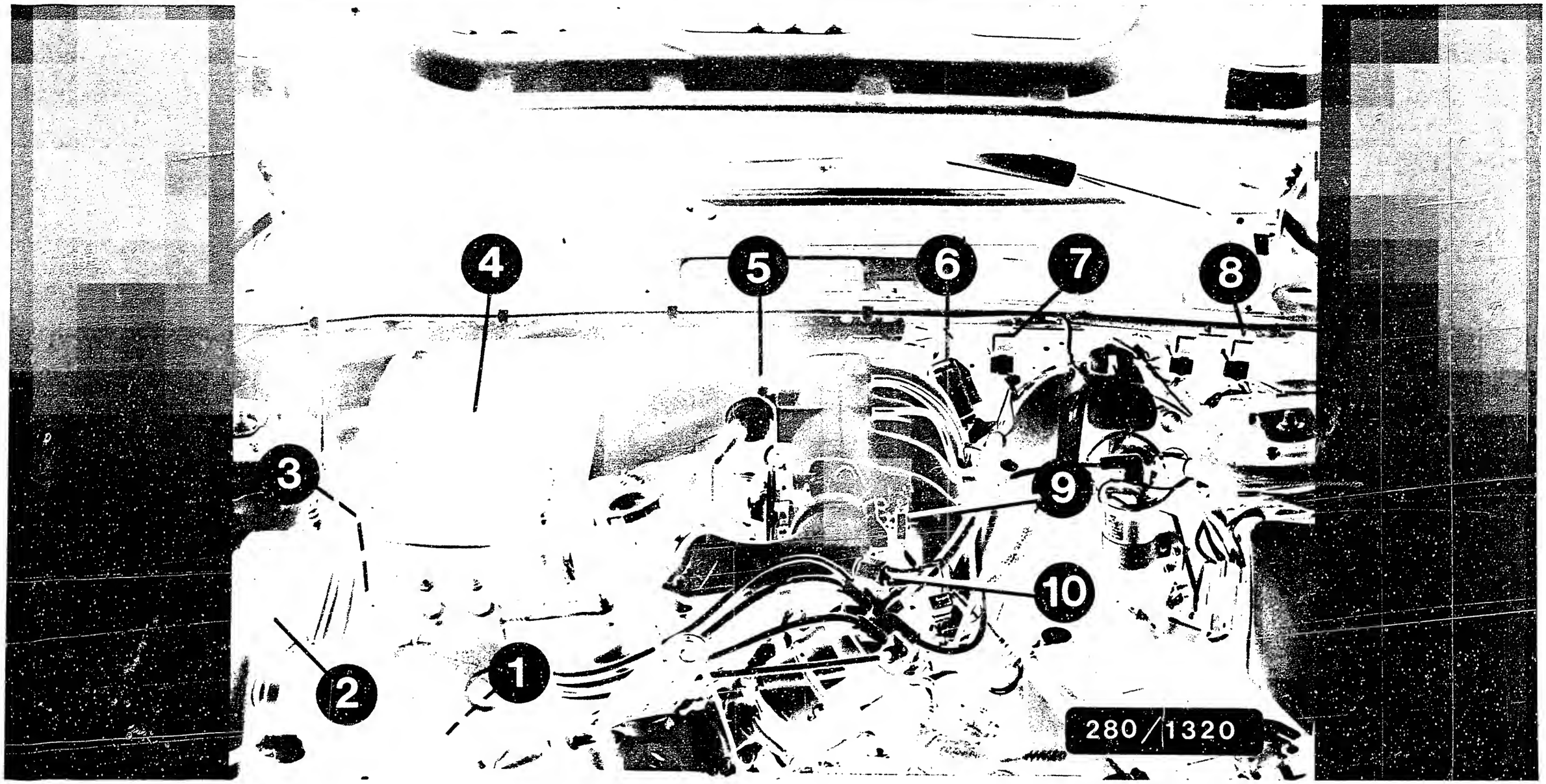
1 = Control unit
2 = Fastening screws
3 = 25-pin control-unit plug

INSTALLATION POSITION OF COMPONENTS

The indications "right" and "left" always refer to the forward direction of travel.

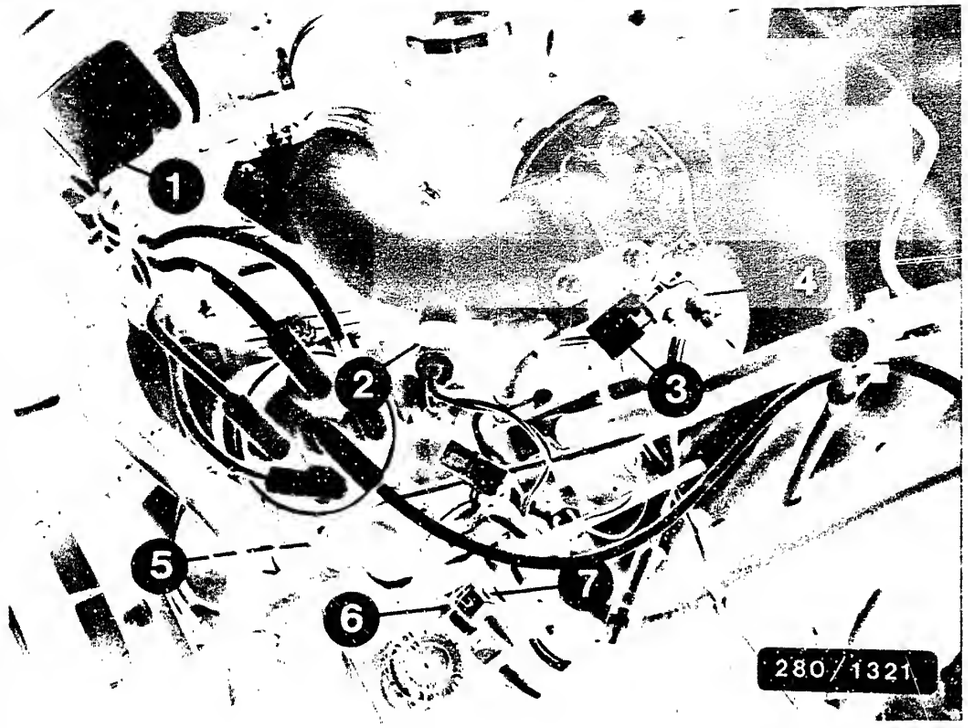
* Control unit:
The control unit is positioned in the passenger compartment, passenger's side, behind the glove compartment.

To connect the universal test adapter, disconnect control-unit plug (25-pin). To do this, push latch in direction of arrow.



1 = To air-flow sensor
2 = Air filter
3 = To pressure sensor (altitude sensor)
4 = Intercooler
5 = Auxiliary-air device
6 = Series resistors
7 = Tank ventilation relay
8 = Auxiliary relay
9 = Throttle-valve switch (idle) and potentiometer
10 = Charge-air-pressure switch

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

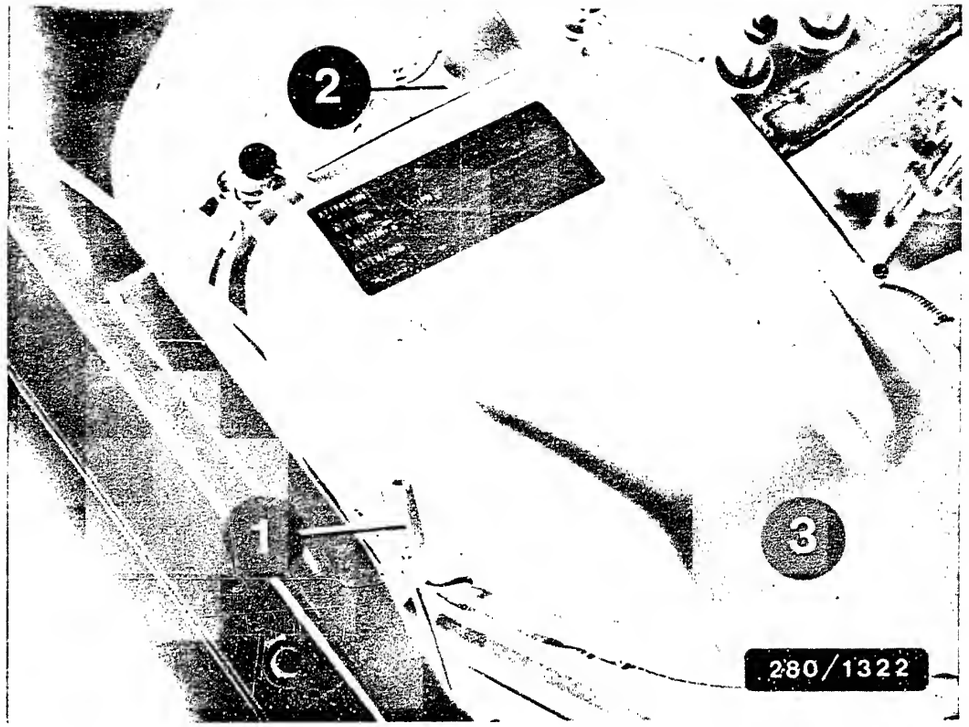


1 = Air-flow sensor
2 = Charge-air-pressure switch
3 = Throttle-valve idle switch
4 = Potentiometer
5 = To temperature switch +60°C
6 = Thermo-time switch
7 = Temperature sensor II
(engine temperature)

INSTALLATION POSITION OF COMPONENTS
(CONTINUED)

* Cold-start valve:
Beneath intake manifold.

* Central ground:
At the firewall on right, behind the cover plate.



1 = Test pin integrator (lambda)
2 = Pressure sensor (altitude sensor)
3 = Air filter

INSTALLATION POSITION OF COMPONENTS
(CONTINUED)

* Control relay:
At left beneath instrument panel.

* Control unit of EI-K ignition:
Beneath the passenger-side footwell panel.

* Lambda sensor: Is bolted into exhaust pipe, in front of right-hand firewall.

* Electric fuel pump:
At left in front of rear axle.

* In-tank pre-supply pump: Is accessible via a central latch in the trunk.

T A B L E O F C O N T E N T S

Trouble-shooting instructions : SEA-5000

BOSCH system : LE 2-Jetronic

Make of vehicle : SEAT

Basic microcard : OPE-502

Test instructions	Coordinates
Special features	M02
Self-diagnosis / Rapid diagnosis chart	M03
Test specifications	M07
Electrical terminal diagram	M09
Diagram of air/fuel lines	M10
Installation position of components	M11

SPECIAL FEATURES

* This microcard contains the LE2-Jetronic trouble-shooting instructions, valid at the time of publication, for the following models:
  Seat Ibiza (11.86 ->)
  Seat Malaga (11.86 ->)
  1.5l/4 cyl.
  LE2-Jetronic

* LE2-Jetronic with 25-pin control unit 0 280 000 337 actuated by term. 5 of the EI ignition control unit
* 5-pin air-flow sensor
* 7-pin control relay
* Solenoid-operated injection valves with brass-wire coil.
* Start control, i.e. additional fuel quantity through all solenoid-operated injection valves
* Cold-start valve and thermo-time switch not installed
* Pre-supply pump

Note:
If reference is made to a basic microcard, always make certain you use the test specifications from the vehicle-specific brief instructions.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

The following rapid diagnosis chart makes it possible for the experienced L-Jetronic expert to quickly check the electric part of the system using the universal test adapter.

The rapid diagnosis chart contains the following details:

* Test step sequence.
* Position of the V- and Ω - program-selector switches.
* Remarks with regard to the operation of the universal
* Test adapter or other components.
* Test specifications for motortester and multimeter.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

Testing the LE2-Jetronic with adapter lead 1 684 463 123

Test step	Switch position V	Switch position Ω	Measurement	Control-unit plug between term.	Remark	Test specifications (reading)
1	5	–	TN signal from EI ignition control unit term. 5	1 <==> 5	Shift into neutral, start	Rectangular pulses on oscilloscope
2	6	–	Voltage from control relay term. 87	9 <==> 5	Shift into neutral, start	8...15 V
3	7	–	Voltage from ignition and starting switch term. 50	4 <==> 5	Shift into neutral, start	8...15 V
4	| V	11	Resistance combination in air-flow sensor term. 8	8 <==> 5		100...200 Ω
5	| V	12	Resistance of potentiometer in air-flow sensor term. 7	7 <==> 5	Deflect air-flow sensor flap as far as will go.	60...1000 Ω
6	| V	13	Resistance of temperature sensor NTC II term. 10 (engine temperature)	10 <==> 5	+15°C...+30°C : +80°C :	1,45...3,3 k Ω 280...360 Ω
7	| V	14	Resistance, ground output stage term. 13	13 <==> 5		0...10 Ω

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)

Testing of LE2-Jetronic with adapter lead 1 684 463 123

Test step	Switch position V	Switch position Ω	Measurement	Control-unit plug between term.	Remark	Test specifications (reading)
8	| V	16	Resistance of idle contact in throttle-valve switch term. 2	2 <==> 9	Disconnect connection plug from ignition control unit	
					Accelerator pedal in idle position	0...10 Ω
					Slightly depress accelerator pedal	infinite Ω
9	| V	17	Resistance of full-load contact in throttle-valve switch term. 2	3 <==> 9	Disconnect connection plug from ignition control unit	
					Accelerator pedal in idle position	infinite Ω
					Slightly depress accelerator pedal	0...10 Ω
10	| V	18	Resistance of all 4 injection valves connected in parallel term. 12	12 <==> 9	(+15°C...+30°C):	7,0... 9,5 Ω
					(+80°C) :	7,2...10,0 Ω

R e m a r k :

The following components with relevant connection leads are not covered by the universal test adapter in the rapid diagnosis chart:

1. Auxiliary-air device — Leads 26 and 9/2
2. Electric fuel pump — Leads 28 and 61
3. Pre-supply pump

Pressure regulator	
* Fuel pressure:	2,3...2,7 bar
Electric fuel pump	
* Fuel delivery at return:	at least 600 cm ^{3} /30 s
* Supply voltage under load:	at least 12 V
Pre-supply pump	
* Fuel delivery:	at least 660 cm ^{3} /30s
Temp. sensor NTC II (engine)	
* Internal electrical resistance at ambient temperature (+15°C...+30°C):	1,45...3,3 k Ω
with engine at norm. op. temp. (approx. +80°C):	280...360 Ω
Auxiliary-air device	
* Internal elec. resistance:	10,0...45 Ω
Air-flow sensor	
* Resistance value between term.8 and term.5:	340... 480 Ω
term.7 and term.5: (fully deflect air-flow sensor flap)	60...1000 Ω
term.9 and term.5:	500... 760 Ω
term.8 and term.9:	160... 300 Ω

Solenoid-op. injection valve	
* Internal electrical resistance at ambient temperature (+ 15° C...+ 30° C):	15,0...17,5 Ω

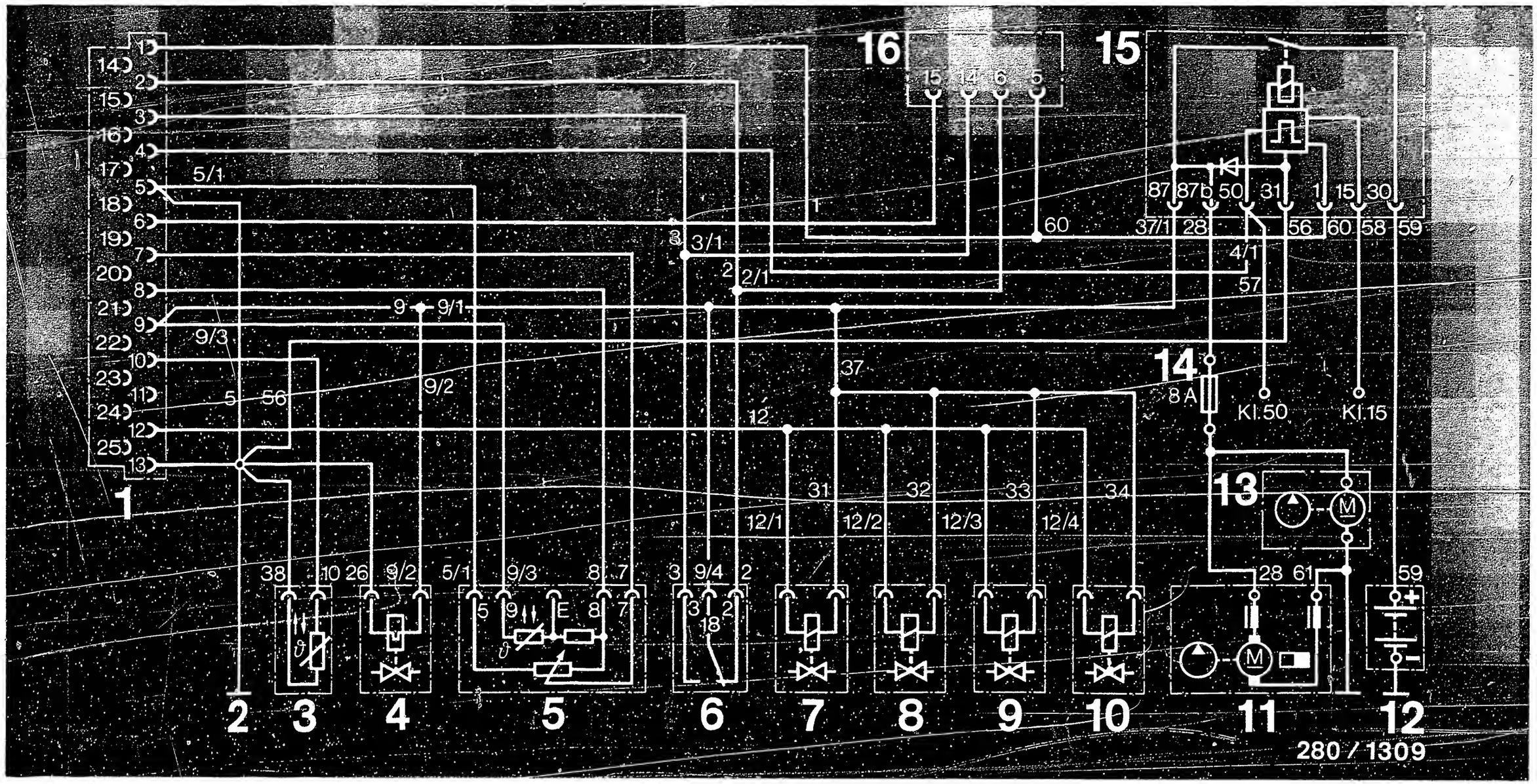
Start control with NTC II connection plug disconnected

Apply ignition cable term.4 to ground via sleeve-type suppressor 5 k Ω and spark gap.

* Supply voltate at one solenoid-operated inj. valve: Drops from initially greater than 2.5 V to approx. 0.3 V within approx. 15 s of starting time.

Idle adjustment	
With engine at normal op. temp.	
* Idle speed:	850...900 min $^{-1}$
* CO setting:	0,5...1,0 % CO by vol.

See equipment and Autodata microcards for settings for ignition, valve clearance and other engine-related data.

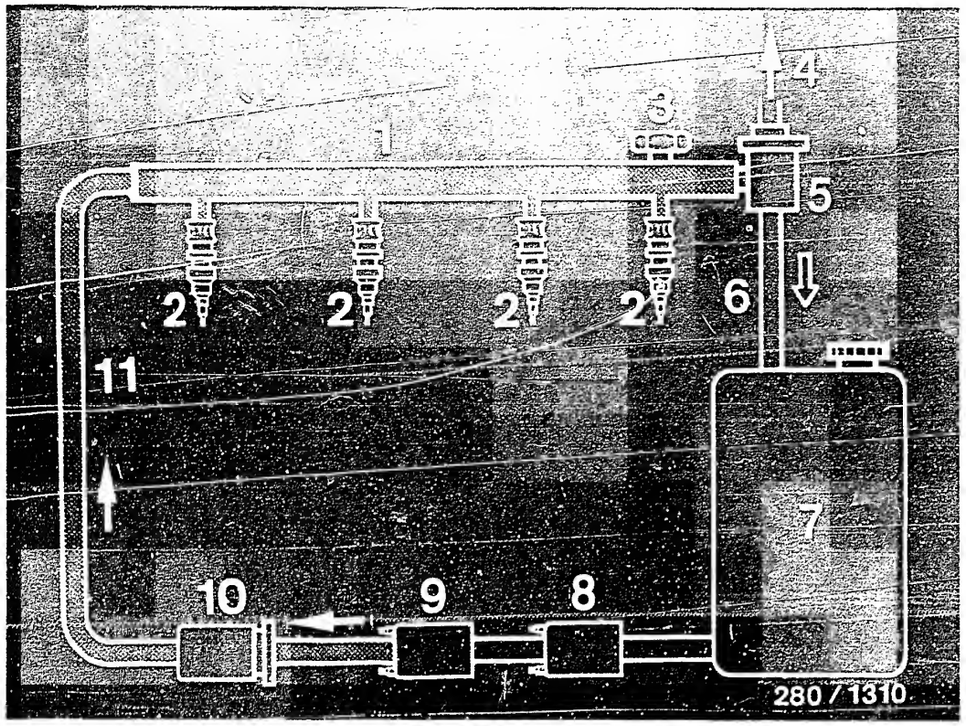


1 = Control-unit plug
2 = Central ground output stage and output stage
3 = Temperature sensor NTC II (engine temperature)
4 = Auxiliary-air device
5 = Air-flow sensor
6 = Throttle-valve switch
7,8,9,10 = Solenoid-op. injection valves
11 = Electric fuel pump
12 = Battery
13 = Pre-supply pump
14 = Pump fuse
15 = Control relay
16 = Ignition control unit

ELECTRICAL TERMINAL DIAGRAM

M09 —⟹

M10 —⟸

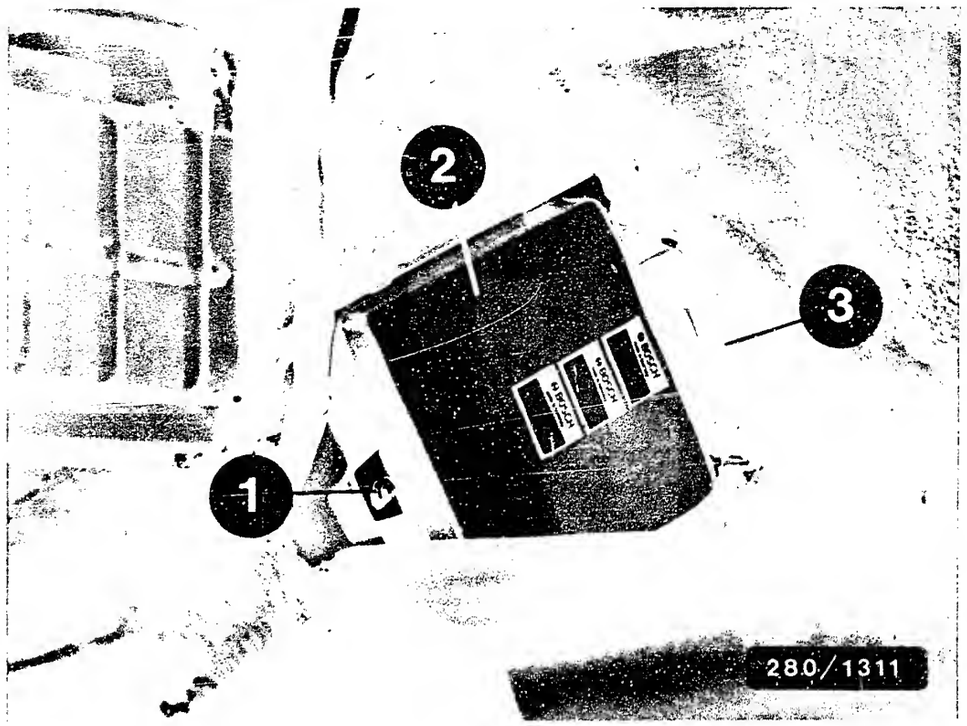


|_____| = pressureless

|:::::::| = Fuel pressure

1 = Fuel-distribution pipe
2 = Solenoid-operated injection valves
3 = Pressure-measurement connection
4 = Intake-manifold pressure connection
5 = Pressure regulator
6 = Fuel return line
7 = Fuel tank
8 = Pre-supply pump
9 = Electric fuel pump
10 = Fuel filter
11 = Fuel-pressure line

DIAGRAM OF FUEL LINES



1 = Fastening screw
2 = Control unit
3 = 25-pin control-unit plug

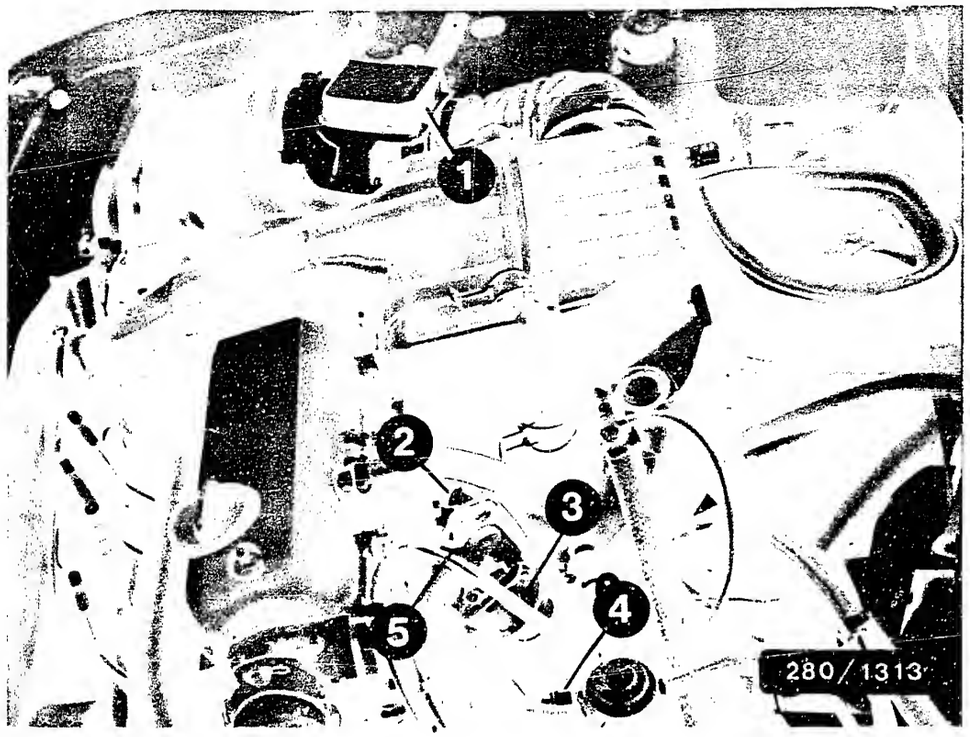
INSTALLATION POSITION OF COMPONENTS

* Control unit in passenger compartment

The indications "right" and "left" always refer to the forward direction of travel.

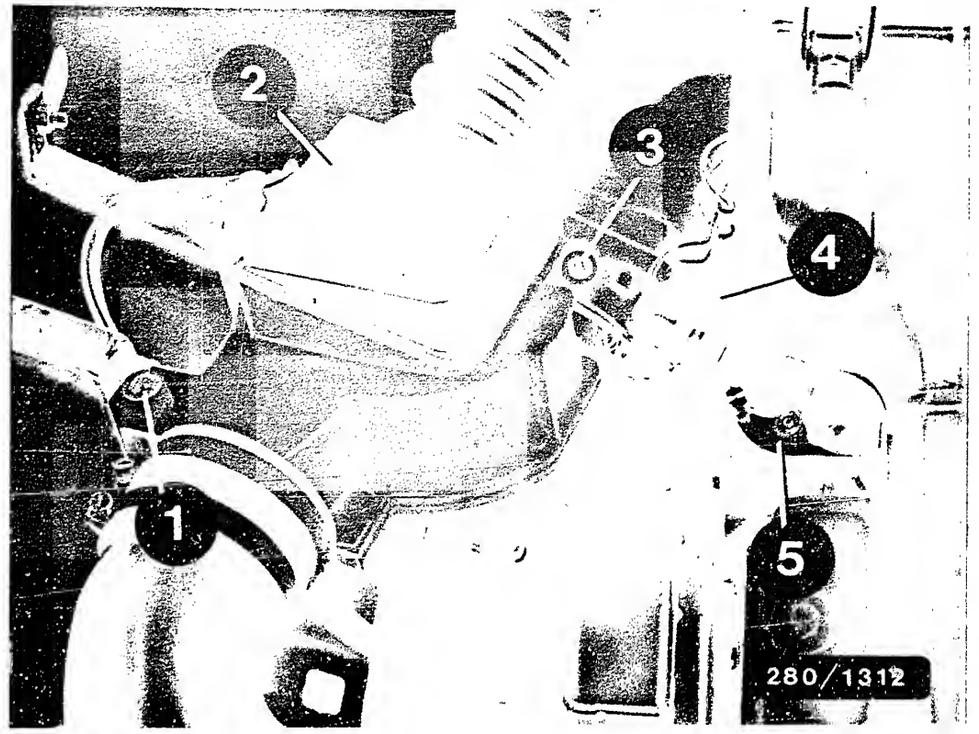
The control unit is positioned in the passenger compartment, passenger's side, at the firewall in the footwell. #

To connect the universal test adapter, disconnect control-unit plug (25-pin). To do this, loosen the panel at the right and push to the left.



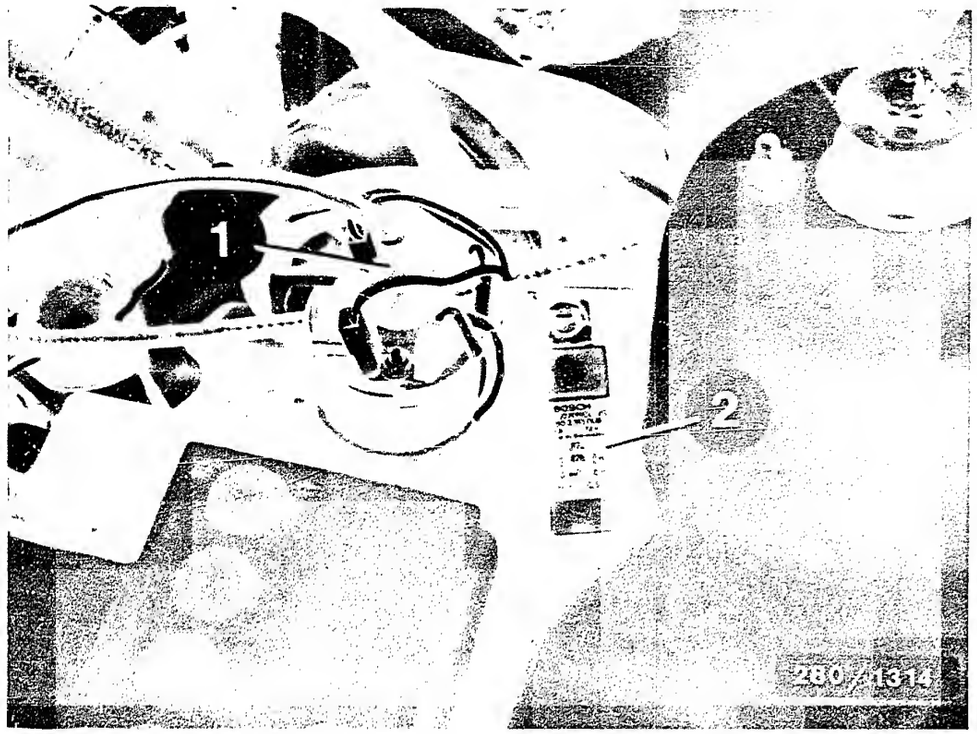
1 = Air-flow sensor
2 = Pressure-measurement connection
3 = Pressure regulator
4 = Temperature sensor (engine temp. ~~NTC~~ II)
5 = Solenoid-operated injection valve

INSTALLATION POSITION OF COMPONENTS (CONT.)



1 = CO adjusting screw
2 = Air-flow sensor
3 = Idle-speed adjusting screw
4 = Throttle-valve switch
5 = Auxiliary-air device

INSTALLATION POSITION OF COMPONENTS (CONT.)



1 = Ignition coil
2 = Control relay

For production reasons:
continued on the following
coordinate.

INSTALLATION POSITION OF COMPONENTS (CONT.)

* Electric fuel pump and fuel filter are positioned on the right in front of the rear axle.

* Pre-supply pump is positioned between fuel tank and electric fuel pump.